# THE ASSOCIATION OF SOCIAL CAPITAL WITH NATIONAL HEALTH CARE SYSTEM STRUCTURE AND FUNCTION

# ASSOCIATION DU CAPITAL SOCIAL AVEC LA STRUCTURE ET LA FONCTION DU SYSTÈME NATIONAL DE SOINS DE SANTÉ

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by

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## Abstract

The characterization of connections individuals have amongst each other -- a concept termed 'social capital' -- as it relates to health care is timely given on-going debates on health care reform worldwide. Patients with strong social support systems have family and friends that assist them in accessing and taking full advantage of health care. Patients who adhere to a treatment plan and have social support often do well, but patients who lack social support are not so fortunate. One factor in improving health care quality may lie in enhancing social capital in addition to bolstering human resources and health care institutions. If we can identify the types of health care system structures that are associated with higher social capital, we can begin to engineer our existing health care systems to take advantage of existing social capital constructs to achieve quality synergy. A substantial body of work has explored social capital as it relates to health care outcomes and metrics of individual and community levels. While the magnitude and clinical significance of the associations are challenged, there are clear links between social capital and health outcomes. What has yet to be explored are possible associations between social capital and the structural organization of health care systems. The core question of this analysis is to explore the relationship between social capital and healthcare health systems on an international scale. This is approached using two case analyses. The first case uses a quantitative regression analysis to explore the association between social capital indices with health care spending and utilization metrics. The second case tests the hypothesis that countries with higher social capital are more likely to have health care systems with socialized structures including provision, regulation, and financing by the state. Health systems with higher levels of bridging social capital are associated with higher health care spending, and higher level of bridging capital was associated with higher utilization of public health and essential service health system functions. The structure analysis revealed that increased social capital index levels are associated with a higher likelihood of socialized, state-centric health

care system structures. This analysis is an important first step in exploring how social capital sculpts health system structure, however the direction of association remains unexplored. Important future research efforts might further hone in on the nuances of social capital in health systems as well as the effect of social capital on specific health policy and intervention performance.

## Résumé

La caractérisation des liens entre individus - un concept appelé «capital social» - dans le contexte des systèmes de soins de santé est opportune compte tenu des débats en cours sur la réforme des soins de santé dans le monde entier. Les patients dotés de solides systèmes de soutien social ont de la famille et des amis qui les aident à accéder aux soins de santé et à en tirer pleinement parti. Les patients qui adhèrent au plan de traitement et bénéficient d'un soutien social réussissent souvent bien, mais les patients qui manquent de soutien social ne sont pas aussi chanceux. La clé de l'amélioration de la qualité des soins de santé peut être d'améliorer le capital social et de ne pas engager plus de prestataires ou de construire davantage d'hôpitaux. Si nous pouvons identifier les types de structures de système de soins de santé associées à un capital social plus élevé, nous pouvons commencer à concevoir nos systèmes de soins de santé existants pour tirer parti des concepts de capital social existants afin d'obtenir une synergie de qualité. Un corpus important de travaux a exploré le capital social en ce qui concerne les résultats et les paramètres de soins de santé et les niveaux individuel et communautaire. Bien que l'ampleur et la portée clinique des associations soient contestées, il existe des liens clairs entre les soins de santé et les résultats pour la santé. Ce qu'il reste à explorer, ce sont les associations possibles entre le capital social et l'organisation structurelle des systèmes de soins de santé. La question centrale de cette analyse est d'explorer la relation entre le capital social et les systèmes de santé de la santé au niveau international. Ceci est abordé en utilisant deux analyses de cas. Le premier cas utilise une analyse de régression quantitative pour explorer l'association entre les indices de capital social et les indicateurs de dépenses et d'utilisation des soins de santé. Le second cas teste l'hypothèse selon laquelle les pays au capital social plus élevé sont plus susceptibles d'avoir des systèmes de santé dotés de structures socialisées telles que la fourniture, la réglementation ou le financement par l'État. Les systèmes de santé avec des niveaux plus élevés de capital social de transition étaient associés

à des dépenses de soins de santé plus élevées et un niveau plus élevé de capital de transition était associé à une plus grande utilisation des fonctions de santé publique et des services de santé essentiels. L’analyse structurelle a révélé que l’augmentation des niveaux de l’indice de capital social accroît la probabilité de structures de système de santé socialisées et centrées sur l’état. Cette analyse est une première étape importante dans l'exploration de la façon dont le capital social sculpte l'infrastructure de santé publique, mais la direction de l'association reste inexplorée. Des efforts de recherche importants à l’avenir pourraient affiner les nuances du capital social dans les systèmes de santé ainsi que l’effet du capital social sur des politiques de santé et des performances d’intervention spécifiques.

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# 1.0 INTRODUCTION

## 1.1 THE PROBLEM

As a physician, I have come to realize that illness and disease do not discriminate. We will all age and encounter the shortcomings of our biology. However, there is significant variability in health outcomes – some are at higher risk of succumbing to illness based on their genetic constitution, the influence of their environment, and the complex interplay between these two factors. In the 20th century, health care practitioners and their allies also began to explore the social determinants of health. It is now well established that geography, poverty, education and culture all play a role in health outcomes in addition to our predispositions.

As an Otolaryngologist, I have cared for patients and their families with complicated and life-threatening illnesses. In the case of patients with head and neck cancer, they often must navigate a complex treatment pathway that involves surgery, radiation, and chemotherapy. In many instances, these patients interface with many other necessary medical services such as speech therapists, nutrition, social work, and palliative care. The needs of their illness produce a lengthy schedule of appointments to keep and resources needed to maximize their opportunities for care. Patients with strong social support systems have family and friends that assist them in attending their appointments and treatments, and to ensure that they stay 'on the pathway.' Patients who adhere to the treatment plan and have social support often do well.

Other patients are not so fortunate. I have witnessed instances where a lack of social support resulted in appointments and critical treatments missed. Patients lacking social support cannot rely upon a family member or friend to transport them to the hospital when they are too weak, debilitated, or lack the means. These patients may not benefit from the collective knowledge of others who have experienced their illness because they have no access to these communities and sources of knowledge. These patients become isolated from society, and

ultimately poor health outcomes are the result. What good are our innovative therapies if the patient does not have the requisite connections to take advantage of them?

The investigation of these connections, what many researchers refer to as 'social capital,' as it relates to health care system performance and design is timely given on-going debates on health care reform worldwide. The idea that social capital is related to the performance of health care systems is not new. Johnathon Skinner – one of the thought leaders in regionalized health care value – has identified an association between social capital and health care quality. (Skinner et al. 2009) Specifically, one factor in improving health care quality may lie in enhancing social capital in addition to bolstering human resources and health care institutions. If we can identify the types of health care system structures that are associated with higher country-level social capital, we can begin to engineer our existing health care systems to take advantage of existing social capital constructs to achieve quality synergy.

Prior work on social capital and health have demonstrated compelling findings in health outcomes related to various conditions spanning from cardiovascular disease, access to care, and all-cause mortality. (Hendryx et al. 2002a; Kawachi 1999a) Recent work has also investigated potential roles in the function and performance of entire health systems and constructs as a contributing mechanism to the regional variability in healthcare spending and utilization.

William et al. produced a landmark paper that attempted to address health care utilization variation from the perspective of social capital in the United States of America. (Williams 2012) They hypothesized that geographic variation in 'self-interested' behavior of physicians was responsible for variation in health care utilization in the United States. Specifically, physicians were more likely to participate in healthcare utilization favoring "lucrative target income" in U.S. regions of low social capital. One of the most poignant results was the strong negative association between social capital and healthcare spending. (Williams 2012)

To date, no analysis has attempted to extend Williams' finding to the level of national health systems. While the dynamics of national health care systems may vary compared to the regional analysis furnished by Williams, a cross-national comparative study may yield insights into health care system design and reform factors and their relationship with social capital.

There are different healthcare system types in existence around the world, each with their own methods for regulation, financing, and provision of care. A typology exists which has classified each of the Organization for Economic Co-operation and Development (OECD) countries health care systems according to intuitive classifiers. (Böhm et al. 2013) Prior work has shown that healthcare utilization is associated with different healthcare system types using this classification system. (Crowson et al. 2017; Böhm et al. 2013) As will be outlined in subsequent sections, a substantial body of work has also explored social capital as it relates to health care outcomes and metrics and the individual and community levels. While the magnitude and clinical significance of the associations are challenged, there are clear links between health care and health outcomes. What has yet to be explored are possible associations between social capital and the structural organization of health care systems.

The core question of this analysis is to explore the relationship between social capital and healthcare health systems on an international scope. Do countries with high social capital have lower health care spending, and lower healthcare utilization? Is it possible that the substructures of a health care system are associated with measurable differences in social capital? To be more specific, is it the case that countries with socialized healthcare components – such as public financing or public care provision – are more likely to have higher social capital? The literature has explored social capital and various determinants of health. Where a relative gap lies is with health care system and structure, which touches on health services. Addressing these questions will start an important conversation about the influence of social capital on higher-level constructs of health care systems, and health care system design.

## 1.2 LITERATURE REVIEW

Social capital is a large topic with many dimensions, interpretations, and applications. The main purpose of this literature review is to introduce the basic concepts of social capital and introduce contemporary works that have attempted to demonstrate an association between social capital and health outcomes – both at the individual patient and community levels. Lastly, I will introduce the gaps in the current understanding of the possible role of social capital and health policy development.

### 1.2.1 A Brief Introduction to Social Capital

As the concept of social capital is central to this analysis, I will briefly discuss its history and relevance to health care. Social capital emerged as concept in the late 1800s and early 1900s as a construct to describe the dynamics of political and social life. (Hyyppä 2010, p. 2) Early theorists including Alexis de Tocqueville, John Dewey, and Lyda Hanifan were interested in why and how individuals in society participated in schools, political associations, and labor unions. (Farr 2004, p. 14, 2004, p. 12; Hyyppä 2010, p. 2) Specifically, these theorists provided broad observational commentary on the interplay of wealth inequity and the labor class, minority groups, and American society itself. In the case of Tocqueville, his Pan-American tour yielded insights into sociological factors that defined the 'have' and 'have-nots' in 19$^{th}$ century America. Principally, Tocqueville believed that "when citizens are classed according to rank, profession, birth, and when all are compelled to follow the path on which chance placed them … no one tries any more to struggle against an inevitable destiny." (Tocqueville et al. 2010, p. 760) There was a strong regionalism in Tocqueville's observations as well. While all Americans "nearly all [came] from a shared stock; but over time climate and above all slavery have introduced marked differences between the character of the English of the South and the character of the English

of the North." (Tocqueville et al. 2010, p. 601) Hyyppa observed in Tocqueville's writings that a dichotomy was painted such that:

> Men settled in the South were individualists and adventurers who came without family in search of wealth, favored slavery and were not interested in the common good. In contrast, those settled in the North were educated, sober and moral family men who were involved in local associations and in the affairs of the township or parish. Tocqueville admired the public spirit of the local communities and townships in the Northern States of America.
>
> Today, of all the regions across the USA, the South still shows the lowest levels of membership in voluntary associations and the least trust in one's neighbors. The early observations of a French visitor for almost 140 years ago still hold true. (Hyyppä 2010, p. 2).

The concept of 'association' or finding belonging to a group, clan, or cause is a repetitive theme in the history of social capital. Indeed, Tocqueville made poignant observations that "Americans of all ages, of all conditions, of all minds, constantly unite … not only do they have commercial and industrial associations in which they all take part, but also they have a thousand other kinds: religious, moral, [intellectual,] serious ones, useless ones, very general and very particular ones, immense and very small ones." (Tocqueville et al. 2010, p. 896) As we will explore in later sections, the spectrum of 'bonding' and 'bridging' social capital subtypes echoes in de Tocqueville's observations. As Hyyppä concludes, the sociological arrangement endured and served as the blueprint for modern society. This observation many indicate that while subject to change, the core social composition of a community may remain despite the passage of time.

From the 1970s onward, a more contemporary and applied approach to social capital began to take form. Three main perspectives on social capital emerged as dominant. (Breede 2017, p. 61) First, Pierre Bourdieu, a French sociologist, described the aggregate capital of society as deriving from economic, cultural, and social capital. (Shortt 2004, p. 12) Bourdieu would later refine the resource-centric definition of social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less

institutionalized relationships of mutual acquaintance and recognition." (Hyyppä 2010, p. 8) This definition took a granular perspective on social capital as it relates to an individual as a transactional unit in society. Second, Robert Putnam introduced the themes of networks and reciprocity as facilitating cooperation (Putnam 2001) Putnam believed that the inherent variables of trust and norms enabled cooperation between individuals and associations. (Hyyppä 2010, p. 12) In this context, Putnam felt "membership in voluntary associations and informal social connections can lead people to trust each other, to discuss issues of community concern, and to band together for collective action." (Katz and Crotty 2006, p. 376) Lastly, James Coleman described social capital as a "social structure that facilitates action." (Breede 2017, p. 61) Summarized another way, social capital is a function that is comprised both of a social structure, and mechanisms to facilitate action by individuals within the relevant social structure. (Hyyppä 2010, p. 12) From the nuances of these three working definitions of social capital rises a common theme – resources mobilized for action derived from membership in social structure.

### 1.2.2 Social Capital and Health

Relating social capital to health care is a natural extension of the applicability of social capital to daily societal life. It is well established that those who have more resources – material or otherwise – are more apt to be healthy. In a broad sense, if an individual has more material resources, then they likely have the means to lead a healthy life and obtain health care. But, how do social capital constructs such as association, trust, norms, and cooperation contribute to health?

The study of social capital as it relates to health care is not new. A sizeable volume of work has amassed since interest in associations between social capital and health began in the 1980s and 1990s. (Averett et al. 2014; Halpern 2005; Policy Research Initiative 2005) I will now briefly review the highlights of this literature, as well as the large gap that remains in considering how the concept and pragmatic use of social capital affects health systems and health policy.

How does social capital affect health? We can parse the association by examining both individual and population health. (Averett et al. 2014, p. 183; Rocco and Suhrcke 2012, p. 7) For individual health, three mechanisms have been proposed. First, increased social connections and networks can lead enhanced access to health information. Rocco and & Suhrcke believe that "the more involved someone is in continuous social interaction, the more likely and less costly he/she can access information on how to cure or prevent diseases, what the best remedies are, and where the best hospital or the most qualified physician is." (Rocco and Suhrcke 2012, p. 7) One could also argue that in the current era of social media and widespread availability of internet access, access to health information – or misinformation – may play a deleterious role depending on the content and context. However, this argument has yet to be examined from a social capital perspective. Second, individuals with high levels of social capital may have access to additional support networks that may assist in time of illness. Rocco and Suhrcke state that even well-financed national health care systems may not provide economic or human resources for many aspects of care, including at-home services or other out-of-pocket costs. (Rocco and Suhrcke 2012, p. 7) Social capital comes into view through the non-economic supports provided in these cases:

> Informal and tacit mechanisms arise as a substitute. This could take the form of reciprocal assistance between neighbours or friends, acting as risk-sharing devices to supplement formal health insurance. In less developed countries, these agreements are even more widespread, given that the formal care system is far less developed than in rich countries. Reciprocal support and assistance are possible only in the context of reciprocal trust, as there is no enforceable contract guaranteeing obligations. (Rocco and Suhrcke 2012, p. 7)

The final proposed mechanism linking social capital and health argues that connected and organized interest groups are effective in political lobbying. (Rocco and Suhrcke 2012, p. 7) Specifically, "at a more aggregate level, social capital may also serve to coordinate people's efforts to lobby public authorities to obtain health-promoting public goods, for example, health infrastructure, traffic regulations, sport facilities and green space areas." (Rocco and Suhrcke

2012, p. 7) While this mechanism has an obvious connection to improving community health, the downstream benefits of lobbying for population-level interventions would likely be transferred to the individual.

The above theories have gained traction amongst proponents of the link between social capital and health through empirical research that has supported the claims. On a national level, increased levels of social capital proxies including trust and membership in community organizations have been associated with improved mortality rates (Pearce and Davey Smith 2003, p. 125), access to health care resources (Hendryx et al. 2002b, p. 98), and decreased prevalence of psychiatric and psychological disorders (Organisation for Economic Co-operation and Development 2010, p. 20). Numerous other papers have also successfully produced associations between social capital and obesity and diabetes (Kawachi et al. 2008, p. 172), and cardiovascular disease. (Kawachi et al. 2008, p. 164) However, no consistent significant associations were demonstrated for infectious diseases (Kawachi et al. 2008, p. 175), or cancer (Kawachi et al. 2008, p. 164). Compared to the work investigating the effects of social capital on individual and community health, we have yet to see the same enthusiasm for looking at how social capital influences or determines health care delivery.

The effects of social capital on population health is difficult to separate from income and wealth inequality. It is well established that communities and societies with restricted access to economic resources (such as low socioeconomic ‘status’) have worse overall health outcomes. Others have further articulated the connection between income inequality and poor health in more certain terms. (Shortt 2004, p. 14) One possible mechanism is when inequality generates a “systematic under-investment in human physical and physical infrastructure … limited income transfers to the disadvantage … and inaccessible health services.” (Shortt 2004, p. 14) That is, a self-fulfilling prophecy is realized by nations that permit the dichotomous existence of the ‘haves’ and ‘have-nots’ through either willful maleficence or ignorant health and social policy

development. Another proposed mechanism invokes a “psychosocial explanation,” whereby “income inequality spawns an awareness of hierarchy and relative disadvantage that results in stress and social tension for those at the bottom of the economic scale.” (Shortt 2004, p. 14) An awareness of hierarchy perpetuates the entrenchment of the ‘haves’ and ‘have-nots.’

To provide a relevant example, consider the place of indigenous Canadians as the frontrunners in Canada’s brand of societal and wealth inequality. Hossain and Lamb have demonstrated that indigenous Canadians with higher levels of ‘human capital,’ defined as education, health status, and social capital, are more likely to have higher income. (Hossain and Lamb 2012, p. 448) Linking health status and income is intuitive. One must be at a given level of health to provide skills or labor to accomplish a job and earn a wage or vice versa. An obvious conclusion is that if the health status of Canadian indigenous peoples is enhanced, then more indigenous citizens are able-bodied to contribute to the workforce. However, Hossain and Lamb take the next step and argue that social capital is also crucial:

> In regard to social capital, a greater degree of inclusion and interaction between the Aboriginal population and the rest of the Canadian society may lead to higher levels of social capital leading to the creation of networks and social relations necessary to improve labour market outcomes such as employment earnings.
>
> Future policy development targeting the income gap will also have a positive impact on the growth and development of the aggregate Canadian economy as well as reducing pressure on the social safety net system. Other countries with persistent income gaps between their Aboriginal and non-Aboriginal populations, such as Australia, may also benefit from the findings. (Hossain and Lamb 2012, p. 449)

In their conclusion, Hossain & Lamb stress that “future research on Aboriginal employment income consider a broader definition of capital to include health status and social capital.” (Hossain and Lamb 2012, p. 449) Indeed, the authors would agree that we can extend this conclusion to suggest that future policy development and research for indigenous Canadians consider the interplay of health and social capital. More broadly, prior investigations

of social capital have been successful in linking social capital proxy metrics to quantitative and qualitative measures of individual and community-level health. However, investigators have been less fruitful in demonstrating how social capital can be used as an effective health policy tool.

### 1.2.3 Social Capital and Health Policy

A frequently cited deficiency in the literature exploring social capital as it relates to health is that few investigators have been able to "go beyond correlations that exist between social capital and health." (Organisation for Economic Co-operation and Development 2010, p. 32) Put another way, investigators have successfully demonstrated associations and correlations between amounts or quality of social capital and medical ailments and their outcomes. However, relatively little effort has been devoted to analyzing social capital and health care at the systems and policy levels. The Organisation for Economic Co-operation and Development (OECD) openly asked if "higher-level institutions [should] invest in health for a more cohesive society, or should these efforts focus on investments in social capital, to improve health in the society?" (Organisation for Economic Co-operation and Development 2010, p. 32) To begin to address this question, we must first explore the relationship between social capital and the health care systems themselves.

One of the key prior, published works that prompted my interest in social capital and health systems arose from William Jackson's study of the relationship between population-level social capital and geographic variation in health care utilization in the United States. (Williams 2012) Geographic variation in health care expenditure and utilization is a widely debated topic. In developed countries, variation in health utilization has been suggested to be related to health care provider practice styles (e.g. their professional training), or physician-induced overuse of health care (e.g. restricted versus excessive use of health care resources). (Williams 2012, p. 318) Williams explored regional variation from the lens of social capital. Specifically, Williams'

hypothesis was that “geographic variation in self-interested behaviour by physicians is responsible for a sizeable degree of the variation on utilization.” (Williams 2012, p. 319) He suspected that when social capital was low, that physicians were more likely to engage in a clinical workload that produced lucrative monetary reimbursement. For physicians in regions with high social capital, Williams believed that “physicians … [felt] more inhibited from recommending highly intensive, low-marginal value utilization, whether due to personal conscience or the expectations of peers.” (Williams 2012, p. 322) Interestingly, Williams’ regression models showed strong correlation between regions with low social capital and higher health care resource utilization. Among the many volumes of literature produced on social capital and health to date, Williams was among the first to demonstrate how such an association may translate into informed health policy development. He concluded that “the policy implication of this insight is that physician payment policies can be tailored to individual communities, with loose controls in high social capital locales and strict controls in low social capital locales.” (Williams 2012, p. 336) However, we have yet to elucidate how social capital might be sculpted by health care system structure and function or vice versa.

## 1.3 PLAN FOR THE PROJECT

The contemporary definition and application of social capital in describing economic and sociodemographic processes has paved the way for new investigations for its use as a potentially robust policy tool. Thus far, I have briefly described the formative years of the social capital concept and how scholars have begun to link social capital to health outcomes in communities. Despite these efforts, there remains a sizeable gap in investigative achievement between the effects of social capital on community health outcomes and the role of social capital as a tool to augment health policy. Before we may begin to use social capital to enact

change at a national health systems level, we must first begin to understand how social capital might influence the structure and function of health care systems.

Having completed the review of the literature, I will now outline the theoretical framework of this project. As I am exploring an association between social capital and health care systems, I will rely upon previously accepted methodologies for classifying and quantifying health system design and performance. The common lexicon of health care system structure includes subclassification of health systems' regulation, provision, and financing. Health care system utilization and performance metrics are plentiful, but I will describe the most commonly utilized variables for their inclusion in my analysis. Measuring social capital has proven to be controversial at best, and impractical at worst. I will describe the arguments for and against the use of proxies for social capital at different levels of investigative depth. I will then describe the analytical approach to combining health care system and social capital qualifiers as a means for quantitatively describing their association. The penultimate deliverable in this project are two case studies using the health system and social capital variables. The first is an analysis of the association of social capital indices on health care system structure. The second is the association of social capital indices on health care system spending and utilization. I will finish the project with a discussion on the policy ramifications of the association of social capital with health care system structure and function, as well as the important questions for future study.

# 2.0 THEORY

In this section, I will introduce the theoretical foundation of this project. Since I am exploring the association between social capital and health care structure and function, it is prudent to characterize the most commonly used descriptors and classifiers for each component of the analysis. First, factors in health care spending and utilization will be explored as markers of health care system function followed by a brief introduction to health care system structure. Second, contemporary approaches to quantitatively measuring social capital will be introduced including the most common proxy measures used and their limitations. Lastly, I will present previously published theoretical connections between social capital and health and how they inform this analysis.

## 2.1 HEALTH CARE SPENDING AND UTILIZATION

At the most granular level, an institution's spending on health care results from the provision of health care services to an eligible population. An institution may be a clinic, a hospital, or a government. Several factors can influence health care spending such as the spectra of disease and health status of the population, transactional costs in obtaining the raw or intermediary resources required for the provision of health services, salaries and wages of health workers and providers. In Canada, several provincial health authorities deploy economic resources to provide health care building infrastructure (such as hospitals, clinics, laboratories, long-term care homes), technology (diagnostic equipment, nuclear medicine facilities, or surgical equipment, to name a few), prescription drugs in inpatient settings (such as antibiotics or chemotherapeutics), and physician renumeration through fee-for-service reimbursement or salaries. (Crémieux et al. 1999, p. 631) To be more precise, the financing and regulation of health care in Canada lies at the behest of the provincial health ministries and not the federal

government. However, when analysts draw comparisons between countries' health care spending the aggregate national total monies spent on health care is presented.

Two of the most commonly used generic metrics of health care spending for comparing countries' health care spending are spending on health care as a percentage of the national gross domestic product (GDP), and spending per capita. (Crémieux et al. 1999, p. 631) Health spending per capita is believed to be inferior to the proportion-of-GDP measure because per capita spending is subject to the age spread of the population, as well as variability in indirect factors such as hospital-derived revenues from patient care and monies diverted to care to the infirm and disabled. (Skinner et al. 2009, p. 2) Intuitively, health care spending as a percentage of GDP can fluctuate with a relative increase or decrease in either spending or GDP. In Canada, fluctuations in spending are typically directed by the elected provincial ministers of health as a direct consequence of resource allocation in their annual budgets. Fluctuations in GDP are typically driven by growth and productivity of the national economy. The Organization for Economic Cooperation and Development (OECD) has produced regular reports on countries' health care spending rates dating back to the 1980s. Far and away, the United States spends a highest percentage of its GDP – 17.1% in 2013 – compared to all other countries who have submitted data to the OECD. (Squires and Anderson 2013, p. 3) Canada comes at a distant ninth in the top 13 countries in the world, however after the United States most countries have clustered health spending between 8 to 11% of GDP. (Squires and Anderson 2013, p. 3) It is important to note that just because a country spends more on health care, it does not necessarily translate to enhanced health outcomes or access to care.

The relationship between health spending and outcomes is murky at best. As the United States is the largest 'spender' when it comes to national health care spending as a proportion of its GDP, it has also been subject to intense study – are Americans getting 'value' out of their dollars spent on health care? Recent evidence is not so optimistic. Despite high spending

levels, Americans have fewer physician and hospital visits, lower life expectancy at birth, higher infant mortality, greater prevalence of chronic diseases, and other major determinants of health compared to the other OECD countries. (Squires and Anderson 2013, p. 6, 2013, pp. 12–13) These outcomes raise questions about where health dollars are going. It appears that the largest drivers of health care spending in the United States is the use of expensive medical technologies, and generally higher costs for health care resources compared to the other OECD countries. (Squires and Anderson 2013, p. 16) Moreover, spending levels alone do not translate into quality of care. There are myriad other factors – such as effective utilization – that contribute to quality of care.

Akin to the investigations of health care spending in the United States, scholars have also investigated the association between spending on health care and outcomes in Canada. As stated above, Canada (10% of GDP) falls well short of the spending levels of the United States (17.1%) but is more closely aligned with other countries such as New Zealand (11%), Japan (10.2%) and Norway (9.4%). (Squires and Anderson 2013, p. 3) One of the most widely cited papers related to the Canadian experience produced by Cremieux et al. revealed interesting findings on the association between provincial health spending and health outcomes. When comparing health outcomes to provincial spending, they found that “a 10% reduction in health care spending [was] associated with infant mortality rates higher by 0.5% among males and 0.4% among females and life expectancies lower by 6 months for men and 3 months for women.” (Crémieux et al. 1999, p. 638) The authors qualify that the relationship between spending and outcomes is nuanced by population density, education, and socioeconomic status where infant mortality and overall life expectancy diverge in these settings. (Crémieux et al. 1999, p. 633) The socioeconomic baseline varies widely between the United States and Canada, but these data suggest that spending ‘too much’ leads to diminishing returns in health outcomes as is the case in United States, whereas not spending enough may lead to adverse

effects on population health. The level of spending that constitutes ‘too much’ or ‘not enough’ has yet to be elucidated, however.

Utilization of health care is like health care spending in that both attempt to quantify consumption of health care resources. However, utilization is distinct from spending in that utilization also requires access to the provided health care for the eligible patient population. Access to health care is a complex interplay of many different factors, but the prominent determinants of access to health care include an individual’s level of education, their geographic proximity to health care resources, and their economic available for obtaining health care. (Crémieux et al. 1999, p. 631) At a granular level, utilization can also be considered a “[relationship] between the structure of the health care sector and access to care.” (Hendryx et al. 2002b, p. 94) Hendryx et al. define the structure of health care as comprising the available physicians, hospital beds, ‘penetration’ of the health networks in a community, as well as the ‘competition’ between health networks in a given region. (Hendryx et al. 2002b, p. 94) Utilization can thus be measured through many different avenues – occupancy rates of inpatient beds, the frequency of use of diagnostic techniques such as computed tomography (CT) scans, magnetic resonance imaging (MRI), or the frequency of specific surgical procedures performed (such as open-heart surgery, appendectomy, or tonsillectomy). The choice in selecting a utilization variable to analyze largely depends on the question being asked. In the case of international comparisons, selecting health care resources of importance to global public health (like treatments for heart attacks or infectious diseases), and health resources subject to the preferential use by providers can be informative.

Utilization of health care resources is strongly influenced by health care providers who preferentially select diagnostic technologies and therapeutic modalities in the evaluation and treatment of disease. While it is difficult to distill down the factors involved in a specific decision made by a health care provider, a framework for provider decision making has been proposed.

(Williams 2012, p. 321) In this framework, providers (e.g. physicians or other front-line providers) make decisions on care based on their role as an 'agent' working in the best interests of the patient, the best interests of society and the common good in being a steward for effective use of health care resources, and their own self-interest in generating income or a preferred lifestyle. As I will explore in the next section, preferential utilization of health care resources is a large driver of regional and geographic variability in health care utilization.

Health care utilization has demonstrated in a vast number of analyses to be highly variable between countries, and between regions within a county. There are two leading hypotheses on the role of health care providers in health care utilization variability in the United States. The first hypothesis is that health care providers conduct the practice of medicine in accordance to their teaching and training through medical school and specialty graduate medical education. (Williams 2012, p. 318) In this instance, providers practice what they have been taught by their predecessors, and their use of health care resources reflect their knowledge of modern medicine. Low value care in this setting can manifest from lack of knowledge or uncertainty in the most effective options for care. (Chassin 1993, YS37) The second hypothesis suggests a more nefarious intention whereby health care providers "induce overuse of healthcare" due to other motivations such as financial incentives. (Williams 2012, p. 318) In this hypothesis, health care providers generate less or negative value to the overall system by providing less effective care. As will be discussed later, there are plausible mechanisms whereby social capital directly influences health care utilization through modulating access to resources, or information dissemination within relevant communities.

In this section, I have introduced factors that influence both national health care spending and health care resource utilization. While contextual and modifying factors are complex, variability in spending and utilization between health systems around the world are compared using macroeconomic metrics such as GDP in the case of spending, and the frequency or

volume of use of specific health care resources in the case of overall health care system utilization. In the next section, I will introduce another layer of complexity that can shape the function of health care systems – health care system structure.

## 2.2 HEALTH CARE SYSTEM STRUCTURE

Many investigators have sought to deductively classify health care systems using different means for characterizing health care system components. However, the majority of contemporary schema for classifying health care systems has boiled down health care system structure components to three major domains. (Böhm et al. 2013, p. 259) At a macroscopic level, the total structure of a national health care system is derived from the organization and nature of each systems' ***care delivery***, ***financing***, and ***regulatory*** components. (Böhm et al. 2013, p. 259) I previously published a manuscript comparing national tonsillectomy rates using a previously published health care system classification scheme (Crowson et al. 2017), and will again use this scheme in this analysis.

The health care system classification scheme first presented by Böhm et al. has been validated against OECD country spending data. (Böhm et al. 2013, p. 263) In their scheme, OECD countries fell into five main 'clusters' of health care system types based on their care delivery, financing, and regulatory system subcomponents. (Böhm et al. 2013, p. 264) For each of these three subcomponents, the predominant 'actors' were assigned as either being from the state, society, or private (**Figure 1**). When these subcomponents are considered in tandem and compared against other combinations, different health system types emerge from the patterns of actors that comprise each system. For instance, in the '*Private Health System'* type in which only the United States of America occupied, private actors serve as the main driver for all three dimensions. Before I proceed in detailing the remaining four main types of health systems as

presented by Böhm, I will outline the roles of societal, state, and private actors in each of the care delivery, financing, and regulatory system subcomponents.

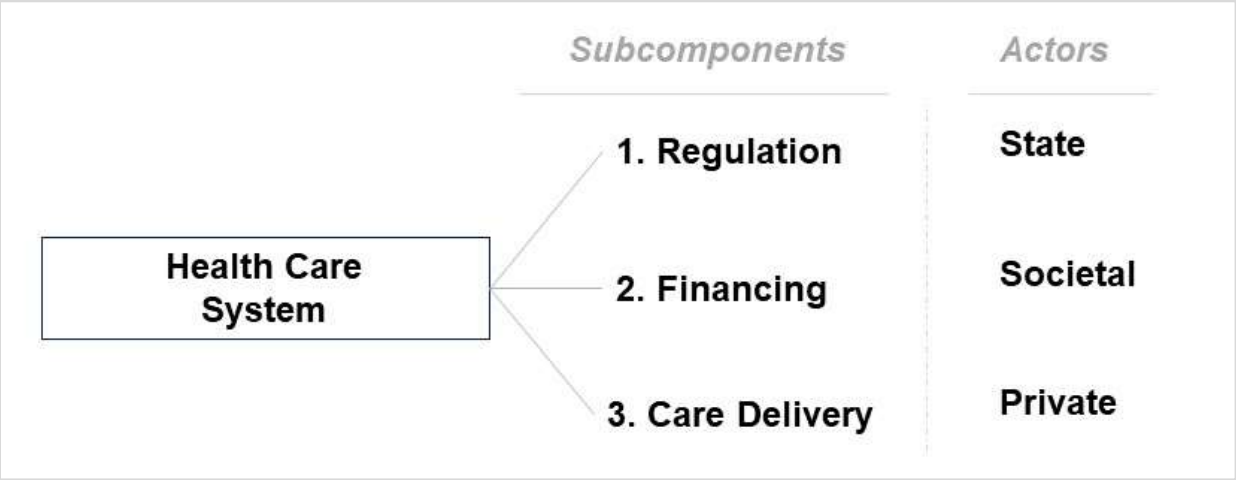


**Figure 2.1**. Structure of a health care system based on its subcomponents and actors presiding over each subcomponent. Adapted from Böhm et al. 2013.

The regulatory component of a health care system is comprised of the links and connections between the systems' financing bodies, health care providers, and the beneficiaries. (Böhm et al. 2013, p. 260) The actors that preside over the regulatory component either govern or control the links and connections between the above elements. A 'state' actor would preside over these elements through a traditional governmental bureaucracy. (Böhm et al. 2013, p. 260) A 'societal' actor controls the regulatory elements through collective bargaining or labor unions. (Böhm et al. 2013, p. 260) Health care system financing encompasses the entities that provide the economic resources that pay for care delivery. When a 'state' actor is the main financier, economic resources are either generated or ear-marked through national or local taxation systems. (Böhm et al. 2013, p. 260) 'Societal' financier actors generate economic resources through channeling funds via accessory government agencies or non-governmental

agencies with the explicit restriction that the government does not have direct access to the funds. (Böhm et al. 2013, p. 260) 'Private' financier actors produce economic resources for care via private insurance or direct out-of-pocket expenses borne by the patients or other direct beneficiary of the care provided. (Böhm et al. 2013, p. 260) Lastly, care delivery includes the entities who are primarily responsible for providing health care to the eligible population. 'Private' care delivery actors are either self-employed or employed in for-profit corporations or other business entities. (Böhm et al. 2013, p. 260) 'State' care delivery actors are direct employees of the government responsible for providing the care. (Böhm et al. 2013, p. 260) 'Societal' care delivery actors work for non-profit corporations. (Böhm et al. 2013, p. 260). After a country's health system is categorized as having one of each of the three actor types presiding over its health care regulation, financing, and care delivery subcomponents, an overall classification of the national health system can be derived.

In the Böhm et al. analysis, they found that OECD countries sorted into five distinct health care system types based on the actor types in each system subcomponent. The first system type is the '*National Health Service'* system type whereby state actors dominate all three of regulation, financing, and care delivery. (Böhm et al. 2013, p. 264) All of the northern western European countries (Sweden, Norway, Iceland, Finland, Denmark, United Kingdom) have this system type as well as Portugal and Spain. The second is the '*National Health Insurance System'* type that has private care delivery, but state financing and regulation. (Böhm et al. 2013, p. 264) Countries that have this system type include Australia, Canada, Ireland, New Zealand, and Italy. Third, the '*Social Health Insurance*' system is the only system where regulation is driven by societal actors. (Böhm et al. 2013, p. 264) Only Germany, Switzerland, Austria, and Luxembourg have this type of system. In this health system type, non-profit entities with some degree of separation from the government drive all three system components. Fourth, the '*Private Health System*' is comprised of private actors dominating all three system

subcomponents. (Böhm et al. 2013, p. 264) As noted in a previous section, the United States is the only 'Private Health System' in the world. Fifth and last is the '*Etatist Social Health Insurance*' type. In this system, there is state regulation, societal financing, and private care delivery. (Böhm et al. 2013, p. 264) Several countries have this system type including the Czech Republic, Hungary, Poland, Slovakia, Japan, Korea, Belgium, France, the Netherlands, and Israel.

Böhm et al. state that systems' care delivery, financing, and regulatory system subcomponents are not entirely independent. For instance, the authors feel that these components "follow a clear order, with regulation leading, followed by the financing dimension and, finally, service provision." (Böhm et al. 2013, p. 261) This is intuitive, as "state regulation is a necessary prerequisite for tax funding, which in turn is a necessary precondition for public service provision." (Böhm et al. 2013, p. 261) Applied to the Canadian system, we can trace out the sequential role of the Canadian Revenue Agency (a state role in a regulatory function), dispersing inter-provincial transfer funds to the provincial governments (a state role in the financing function), who then reimburse health care providers who provide health services to the eligible population (a private role in the care delivery function).

We cannot divorce the impact of political institutions from health care structure. Just as health care systems can be deconstructed into components and sorted into distinct types, so can political systems. In the OECD, the main political system types are '*social democratic*,' '*Christian democratic*,' '*liberal*,' and '*authoritarian conservatives*.' (Navarro et al. 2006, p. 1033) Similar in spirit to my analysis, Navarro et al. analyzed in the effect of political system type on infant mortality and life expectancy. (Navarro et al. 2006, p. 1035) Within each political system type are different institutional behaviors and policy trends for income redistribution, income equality, and length of rule. For example, political systems that are egalitarian are more likely to enact redistributive resource policies. (Navarro et al. 2006, p. 1036) The principal findings of

Navarro's analysis is enhanced health outcomes are more likely to be associated with governments that have redistributive policies. (Navarro et al. 2006, p. 1035) Moreover, Navarro found a negative correlation between life expectancy and income inequality indices. (Navarro et al. 2006, p. 1035) While there are many confounding variables that could account for the correlation between income equality and redistribution and health outcomes (such as public education, social benefits), it is intriguing that political system structure is associated with measurable outcomes. What has yet to be explored is that if political system types are more likely to have a certain health care system type akin the five main health system types described by Böhm. Nonetheless, Navarro's findings reinforce the idea that political policies – indeed political ideology – can impact health outcomes.

In this section, I have introduced Böhm's novel health system typology that categorizes OECD health system types into distinct clusters based on the type of actors that preside over the health system subcomponents. In using OECD country data in my analysis, Böhm's system will enable us to examine the association between social capital and distinct health system types as well as the system subcomponents of regulation, financing, and care delivery (**Figure 2**). We must also acknowledge that different health care system structure classification schemes exist. (Tavares 2017) For instance, the OECD generated their own system classification that places health care delivery into a public-private continuum. (Deber 2018, p. 38) The OECD system classifies health care financing into four distinct categories including: 1. "entirely public," 2. "public or quasi-public", 3. "private third-party", and 4 "private, but direct out-of-pocket." (Deber 2018, pp. 39–40) Nonetheless, we have chosen to proceed with Böhm's typology as the authors have successfully applied their own typology to comparative quantitative analyses in the OECD dataset. (Böhm et al. 2013) The limitations of Böhm's typology are discussed in **Section 3.4.**

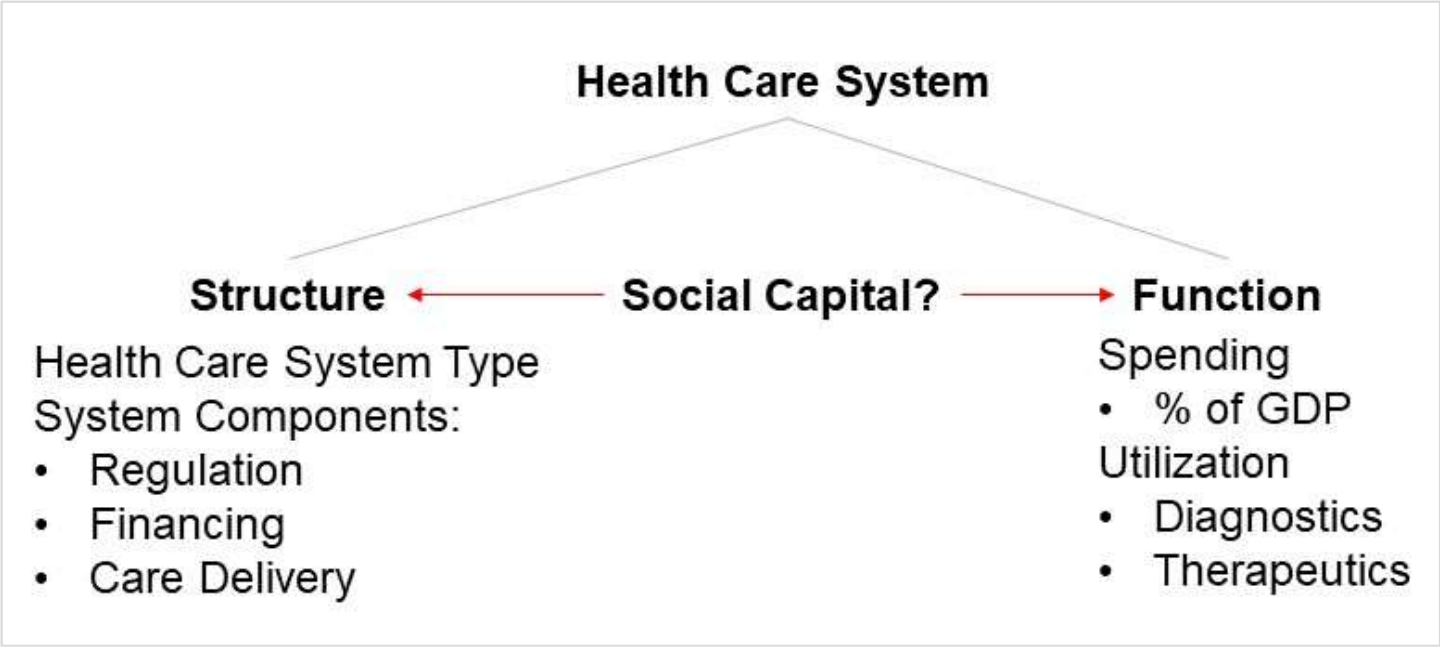


**Figure 2.2**. The potential central role of social capital in the structure and function of a national health care system.

## 2.3 MEASURING SOCIAL CAPITAL

The measurement of a concrete variable such as the number of CT scans or heart bypass surgeries performed per year is relatively straight forward, but the measurement of a nebulous construct like social capital is more challenging. Nonetheless, a systematic approach to social capital measurement is needed to explore associations between social capital health care structure and function. In this section I will briefly introduce approaches to measuring social capital including their pitfalls and limitations. First, I will introduce the concepts of bonding and bridging social capital as this contextual overlay can be helpful in interpreting the different social capital metrics.

### 2.3.1. Bonding and Bridging Social Capital

In addition to the contemporary definitions of social capital introduced earlier in this manuscript, social capital scholars have also generated a 'bonding' and 'bridging' subset of social capital descriptors to further characterize interpersonal and interorganizational networking. Put simply, bridging social capital is concerned with the tolerance, acceptance, and outward inclusion of social groups – however defined – that are different than the index group. (Breede 2017, p. 145) In an actionable context, bridging social capital "connects different groups or networks to attain a shared objective or set of objectives." (Ogden et al. 2014, p. 1078) Bridging social capital in context of health care might resemble different stakeholders in each polity (such as patients, providers, or administrators) rallying together to drive lawmakers to enact health policy reform. The direct ties and values shared between the disparate groups may be weak, but the shared vision and common goal of health care policy reform overcomes differences.

Bonding social capital refers to the co-operative dynamics between members of a singular group grounded in the members' similarity or likeness. (Ogden et al. 2014, p. 1077) In bonding social capital, the groups "share a common identity around which the network forms to build social cohesion and increase the influence of participants in the broader community." (Ogden et al. 2014, p. 1077) In health care, an example of bonding social capital might manifest as a patient advocacy group for a rare disease. In this group, individuals are strongly linked by a common bond (the rare disease) and find comfort and strength in their connection as a means of achieving goals for the group (e.g. fundraising, advocacy efforts). Boding capital can help by providing a sense of community. However, the sense of community might come at a cost of exclusivity that can manifest through distrust of those not part of the group.

We can be led to believe that either bonding or bridging social capital is 'good' or 'bad' depending on the groups' intentions and activities, but both have advantages depending on the

context. One of the major advantages of bridging social capital is that bridging social capital "can connect heterogeneous people across social groups, even across social classes." (Hyyppä 2010, p. 13) In this sense, bridging social capital is especially useful for mobilizing citizens to engage in societal and political reform. Bonding social capital may be more advantageous at the community level where residents of similar socioeconomic dispositions pool resources to support the infirm in their communities. This can translate into information sharing or material resource transfer in the form of volunteering time or money. Regardless of the interpretation, bonding capital has been linked to the concepts of 'trust' and 'trustworthiness', whereas bridging capital is more aligned with tolerance, and confidence and/or participation in civic activities. (Breede 2017, pp. 78–79; Ogden et al. 2014, p. 1077; Breede 2017, p. 145) These distinctions are important as some established social capital metrics described below may therefore better represent bridging and bonding social capital.

### 2.3.2. Commonly Used Metrics

Despite the nuances of social capital and its serviceable definition lying in the eye of the scholar, there has been some consistency in the use of metrics in published analyses. In general, social capital scholars have relied upon measures of social support, trust, civic or community engagement, and political participation. (van Kemenade 2003, p. 5) In this section, I will describe the applicability of these concepts to the study of social capital. While there is considerable overlap between some of these domains, there are main themes that allow the domains to stand independent to one another.

The concept of trust is one of the most widely cited and measured variables in social capital analyses. Trust is a broad concept as it covers an individuals' trust, a community's trust, as well as the perception of law and order. (Breede 2017, pp. 107–108) Breede believes that

trust is “the link between bridging and bonding social capital.” (Breede 2017, pp. 107–108) Moreover, trust has been declared as one of the “most sensitive indicators of social capital” in its role as linking interpersonal relationships and relationships with institutions – a slightly different take than Breede noted above. (van Kemenade 2003, p. 16) At the interpersonal level, trust can be considered a ‘credit’ generated between two individuals during a tangible or intangible transaction. (van Kemenade 2003, p. 16) Put more simply, an individual will develop trust in another if the individual believes the other will act in good faith and in their best interests – in business, social affairs, or otherwise. Trust in an institution is similar with respect to the expectation of acting in their perceived best interests.

Individuals may participate in associational activities by hobby and/or volunteerism insofar as the activity brings individuals together under shared interests. Association in labor unions is also included under this domain. (Shortt 2004, p. 14) One review has highlighted the many benefits of volunteerism including the acquisition of new knowledge through social interaction, inclusion of disparate ethnocultural groups, the expansion of bridging capital through the generation of new opportunities for social capital, and even the spread of societal democratization through creating new “centers of loyalty.” (van Kemenade 2003, p. 19) Moreover, volunteerism may be associated with health benefits derived from the satisfaction and gratification discovered in performing the aforementioned functions. (van Kemenade 2003, p. 19) Participation in associations or volunteerism is different to civic participation in society as membership in an association or volunteer group need not represent a broad political effort or duty. Classic forms of civic participation in a community are voting, membership in a political party, or lobbying. (van Kemenade 2003, p. 19) On the other hand, association or volunteer groups may be big or small in membership and may also have a large or discrete scope.

Social cohesion is a linked, yet separate entity to social capital according to some scholars. More specifically, social cohesion is generated from the shared values and

challenges that contribute to community-building. (van Kemenade 2003, p. 17) In this sense, van Kemenade believes social capital is a *contributing factor* to social cohesion. Given the explanation of bonding social capital, I fail to see the firm difference between social cohesion and bonding social capital if not for specific contexts where social cohesion is the gross end-product of the process of bonding capital. Whether social cohesion is simply a proxy for bonding capital or serving as a parallel concept, the applicability of social cohesion to social capital analyses is relevant.

In the construction of an analytical approach to social capital, an investigator may elect to challenge the study population with one more queries from the social capital domains. For instance, an investigator may produce a questionnaire that assesses respondents' trust in their neighbor, number of association memberships, or annual hours devoted to fundraising for a political party. In presenting a nominal number of indicator variable questions, the investigator may be at risk at introducing confounding variables based on the respondent population context. For instance, comparing citizens' political activity of a constitutional monarchy like Canada to a communist country like China may produce vastly different responses due to the inherent political traditions. An alternative approach would be to utilize indices – composite measures of social capital indicator variables. In this way, a "disparate group of indicators or measures [are reduced] to a single number to facilitate a higher-level comparison." (Breede 2017, pp. 103–104) There are different indices available for investigators including the Petris Social Capital Index, the Indices of Social Development, the Putnam Index and the World Values Survey. (Organisation for Economic Co-operation and Development 2010, p. 13; Averett et al. 2014, p. 183; Breede 2017, pp. 104–105) Each have their advantages and disadvantages based on which social capital domains are included.

In this analysis, I have utilized country-level indices of social capital rather than discrete domain-based questions. The rationale being that the indices have the potential to capture the

spirit of each social capital domain compared to one measure. I am assuming that by using an index, the analysis is less likely to be influenced by substantial outliers derived from single metric measurements in the absence of an explainable confounder or contextual modifier. The indices are readily available for the countries included in this analysis. The six chosen social capital domain indices furnished by The International Institute of Social Studies (ISS) include "Civic Activism," "Clubs and Associations," "Intergroup Cohesion," "Interpersonal Safety and Trust," "Gender Equality," and "Inclusion of Minorities." The characteristics of these indices are described in greater detail in the methods chapter that follows.

### 2.3.3. Pitfalls and Limitations

At the highest level, critics of social capital believe that without context, drawing conclusions from social capital analyses is meaningless. (Shortt 2004, p. 13) This criticism demands that when designing a social capital experiment, one must be thoughtful in determining a specific question including which measurements are available to provide data and ensuring that the measurements are relevant to the question asked. In this next section, I will briefly outline the challenges with social capital as an analytic tool as well the lack of consensus on the 'best test' to assess social capital in a population.

One of the core arguments against the use of social capital as an analytic tool is the inclusion of 'capital' in its definition. Some scholars feel that the 'capital' in social capital is vague, imperceptible and confusing. (Breede 2017, p. 68) In an economic discipline, capital represents an asset that can traded, gained, lost, and quantified. In some instances, the connections of a social network can be quantified through the number of connections and individual or group may have to others. Quantifying social cohesion, trust, and gender equality is more complicated. Others feel that social capital is "is too broad for social psychological study." (Cozzolino 2011, p. 303) However, investigators need not shy away from attempting to use social capital proxies because the measurement appears problematic. In health care, the

measurement of pain is equally vexing as pain perception is subjective and subject to several factors including the stimulus and interpretation of the stimulus within the central nervous system. Assessing pain is vital as it is an indicator of suffering and unresolved needs. Because of this unmet necessity, health care professionals developed and validated various pain scales and other assessment tools to address this need. These tools are now the front-line measure used in health care settings around the world.

The measure of social capital is in its infancy, but a few proxies have been widely used. Which proxy metric of social capital is the 'best test'? The answer to this question is elusive given the heterogeneity in the descriptions of social capital and its applications. Trust does not trump social support, nor does civic activism better represent social capital than intergroup cohesion. One of the workarounds discussed in previous sections is the use of indices of a collection of social capital indicator variables to circumvent the limitations and weaknesses of utilizing a single proxy variable. However, an index of imperfect variables does not generate collective strength. The development of an internally and externally valid, generalizable proxy measure is one of the most important challenges facing the future of social capital analytics.

High quality studies in health care and health outcomes are often judged upon the rigor of the study design. The gold-standard study design in health care is the randomized control trial whereby both investigator and participant are blinded to the study intervention. Designing randomized trial involving health outcomes and social capital has been elusive. (Hyyppä 2010, ix) Put another way, how does a test subject become blinded to their level of social capital? In an experiment to assess the effect of social capital on a disease such as cancer would require the test subject to be oblivious to their family and local supports and trust in their community and institutions. However, blinding a patient to their social capital may alter their implicit or explicit use of social capital. Social capital methodologists will need to develop alternative means to isolate social capital as an independent variable.

## 2.4 LINKING SOCIAL CAPITAL AND HEALTH

I have introduced factors underlying health care structure and function as well the common use and challenges facing social capital analytics. To date, much prior work on social capital and health has examined the relationship between social capital and individual or community health outcomes. There has been comparatively very little published on the association between social capital and health care system structure and function. To that end, some critics of social capital have stated that the use of social capital as a policy tool is premature. (Shortt 2004, p. 17) If we are to further develop the case for using social capital as a health policy tool, it is critical to explore the associations between population-level social capital and health care systems.

Before outlining the potential role of social capital and health care system structure and function, a brief consideration of where social capital falls in context of other determinants of health is necessary. Eleven main determinants of health have been identified (Deber 2018, pp. 11–12):

- Income and social status,
- Employment and working conditions,
- Education and literacy,
- Childhood experiences,
- Physical environments,
- Social supports and coping skills,
- Healthy behaviours,
- Access to health services,
- Biology and genetic endowment,
- Gender, and
- Culture.

Social ‘supports and coping skills’ – or social capital – is one of the named determinants and is engaged in complex interconnections with other health determinants (**Figure 2.4).** It is beyond the scope of this project to characterize each determinant and their respective links to social capital. Nonetheless, acknowledgement of the interconnected complexity is required for this analysis that isolates the link between health care system structure and function with social capital.

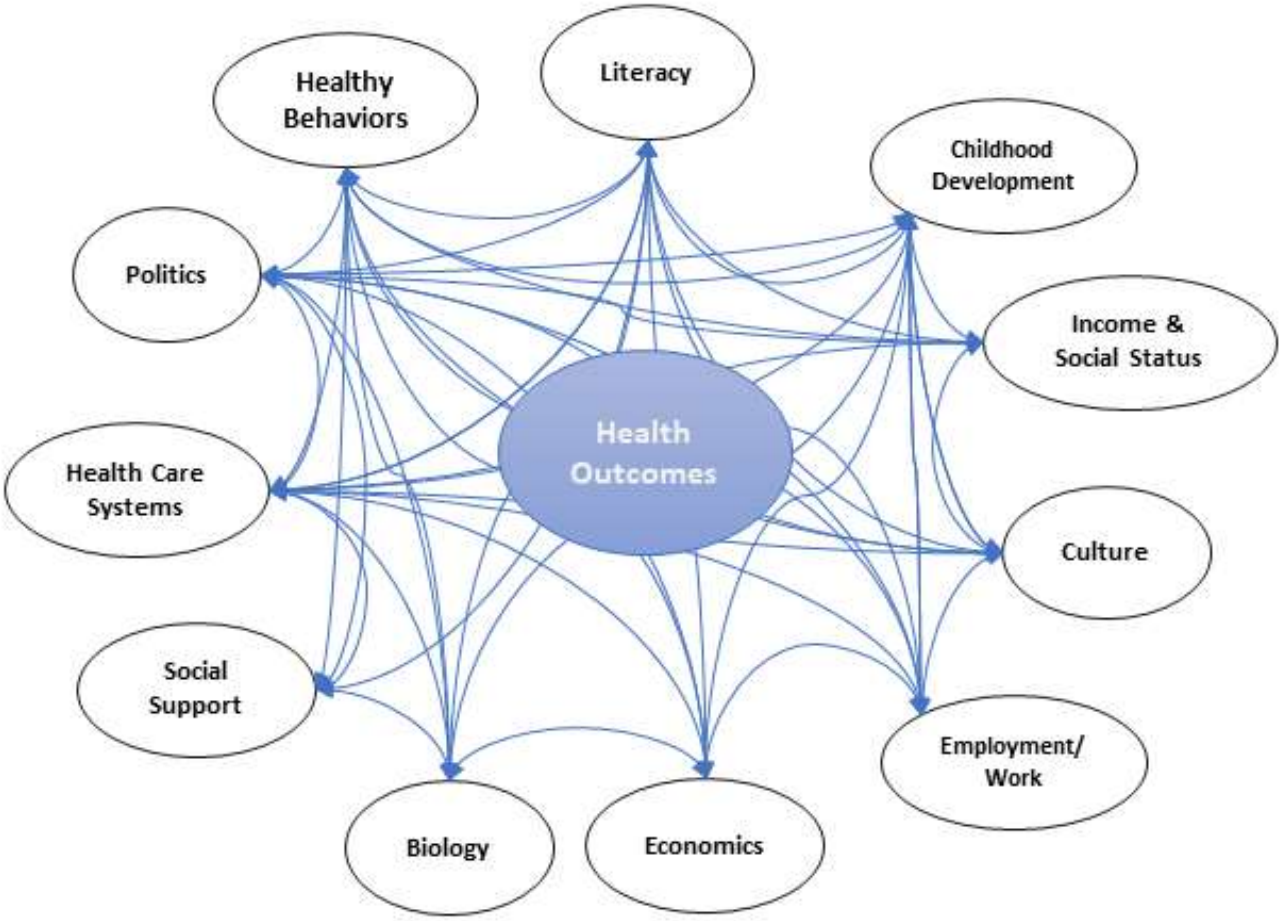


**Figure 2.4**. The eleven determinants of health.

### 2.4.1. Previous Theoretical Connections

The literature on social capital and health policy is thin. In this next section I will review a few recent studies have begun the exploration and have laid down an early foundation as a springboard for future study.

Kawachi is one of the thought-leaders in social capital and health and has presented a conceivable mechanism between political activity and health policy. One of the fundamental civic activities of a citizen is to participate in the institutions of government to force change in policy. Individuals can do this through a variety of means but engaging with interest groups and lobbyists is a well-established route. In Kawachi's analysis "a higher level of political participation ensures that governments are more responsive in their policies toward taking care of the needs of the most disadvantaged members of society." (Kawachi 1999b, p. 124) Kawachi qualified this conclusion through asserting that participants need to be sourced from the entire socioeconomic spectrum. As the spread of chronic disease is unequally distributed among social classes (such as certain diseases may be more prevalent in lower socioeconomic strata), the interests of the politically active risk driving the outcomes of the policy process to reflect the narrow interests of the strongest voices.

To extrapolate this observation to a health care system structure, a citizenry with relatively low civic participation (implying low social capital) might be associated with a poorly performing health care system. An inactive citizenry might provide impetus for governments to determine health policy without recourse for its decisions or concern for the needs of the population. To echo this purported association, Skinner and colleagues suggested that "states with high levels of social capital tend to legislate more comprehensive support programs for their residents and pay health care providers more." (Skinner et al. 2009, p. 5) Indeed, nations with higher social capital likely have a more active citizenry advocating for their needs. Interestingly, Skinner also suggested a possible health care spending and utilization link

whereby “physicians who live in these high social-capital states are more likely to adopt new and effective innovations rather than simply performing more tests and procedures with questionable medical efficacy.” (Skinner et al. 2009, p. 5) Skinner et al. do not elaborate on this further, but a plausible claim is that a society with enhanced bridging social capital behavior harbors a collective conscious to be faithful stewards for health care resources. On the other hand, a distrustful population may be less likely to use health care resources wisely.

Along similar lines for political activation enhancing health policy at a national level, community-level focused health policy initiative development might also be enhanced by bonding social capital. Recall that bonding social capital is the sociologic glue that binds individuals and groups with shared interests, goals, and values. Thus, harnessing bonding capital might be helpful in rallying resources around a specific community health need. In Ogden’s work on bolstering community health through social capital, he introduces several social capital domains that might contribute:

> Engaging communities in improving service delivery and generating demand and support for sustainable community-based services…overcoming resistance and building trust by involving men, youth, parents and religious leaders in awareness raising...linking communities with district health staff to share data and increase visibility and developing community capacity to carry out monitoring and evaluation activities. (Ogden et al. 2014, p. 1081)

Overcoming resistance to health care resource utilization, improving service delivery, and increasing visibility are all solutions to improving access to health resources. Improving access to health resources may lead to increased health system utilization in this regional context, but also may produce increased utilization realized on a national systems level. Conversely, increasing visibility and service delivery may also shift the utilization patterns from less desirable or low value care to higher value care if knowledge of the ‘better’ or ‘more responsible’ way for care is disseminated. For an impact of these social capital mechanisms to be felt on a national level, the collective efforts would need to be pulling in the same direction. This is a generous

assumption given the inevitable heterogeneity in health care utilization and levels of social capital within a given country.

### 2.4.2. Theoretical Connection for this Analysis

If we accept the conclusion offered by Skinner that higher social capital is responsible for enhanced health care resource stewardship, we should expect to find that countries with high social capital indices to have lower health care spending, and possibly lower healthcare utilization. As stated previously, health care utilization is complicated and is influenced by disparate forces including access to health care and appropriate use of available resources. Enhanced access to resources for the entire population resulting in higher utilization is a good thing, whereas increased utilization due to improper use of resources is not. Skinner's theory on health care stewardship is also in line with Williams' theory on social capital and healthcare utilization where the selfish behavior of physicians (like improper utilization) is symptomatic of regions of low social capital.

Given the conceivable association between civic participation and favorable health policy development as introduced by Kawachi, it is plausible that countries with higher social capital are more likely to have health care systems with socialized substructures such as state provision, regulation, and/or care financing. The direction of causality is unclear as it is also conceivable that the socialized government behavior enhances national social capital. Prior work outside of the health domain hint at such a causal mechanism. For instance, Radnitz and colleagues found that individuals' "interaction is higher under less repressive regimes and is further increased by development interventions...trust and norms are higher under conditions of greater repression" when studying post-Soviet central Asia. (Radnitz et al. 2009, p. 723) However, this is a major weakness of this proposed theoretical connection as it relates to health

care as no empiric data to support a causal mechanism have been published as of the writing of this manuscript.

The main goal of my analysis is to explore the association between social capital indices and health care system structure and function. The literature has explored social capital and various determinants of health. Where a relative gap lies is with health care system and structure, which touches on health services. Given the lack of prior work in this specific realm, the mechanisms driving the association between social capital and system structure and function remain in the realm of the philosophical. The spirit of this analysis is to isolate the the relationship between social capital with health system structure and function and provide a novel test of potential associations (**Figure 2.4.2**).

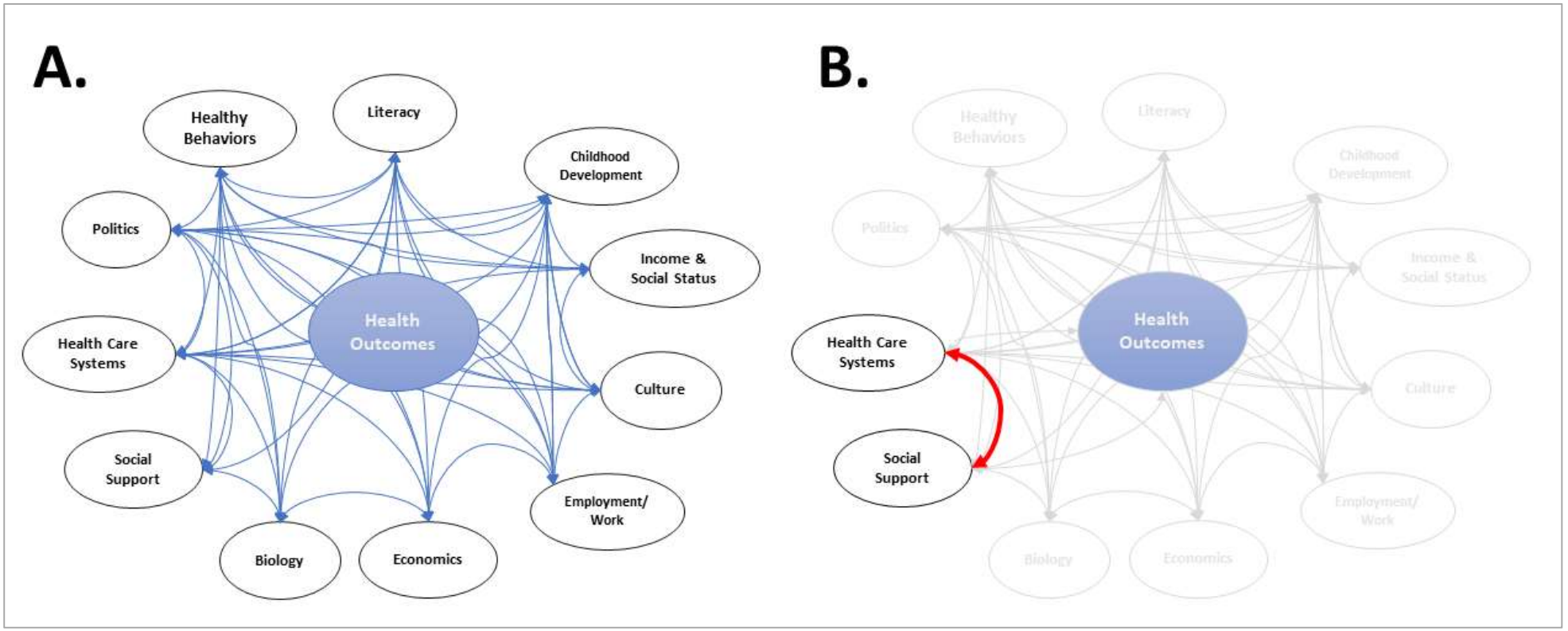


**Figure 2.4.2**. **A)** Social capital is linked to other determinants of health. **B**) The present analysis isolates the relationship between social capital and health care systems' structure and function.

# 3.0 METHODS

Now that I have outlined the prior work and early theoretical foundations to support an association between social capital and health care system and function, I will introduce an analytic approach to examine the relationship between social capital and both health care system structure and spending/utilization (the 'function').

## 3.1 HYPOTHESES TESTED

Based on the prior work outlined by Williams, it appears health care utilization and spending were related to a population's level of social capital. Specifically, higher regional healthcare utilization and spending were correlated with lower measures of social capital. (Williams 2012) The mechanistic reason for this may have been health care providers' behaviors in performing more services with financial incentives baked into the activities performed. Prior to my study, there have been no published works that have investigated the relationship between social capital and health care spending with a cross-national comparison of healthcare systems. For this analysis, I tested two hypotheses:

> **H1:** Countries with high social capital have lower health care spending, and lower healthcare utilization in line with Williams' theory of social capital and healthcare utilization,
>
> *and*
>
> **H2:** Countries with higher social capital are more likely to have health care systems with socialized structures such as state provision, regulation, or financing.

The assumption underlying **H2** is that state-operated or financed health care systems remove the financial incentives – and the resultant perverse healthcare provider behaviors - that lead to elevated health care utilization. In addressing both hypotheses, I hope to further the discourse on the impact of social capital on health policy.

## 3.2 DATABASES UTILIZED

To test the above hypotheses, health care spending, utilization, and social capital data from individual countries were mined from publicly available databases on the internet. To compare the above quantitative measures against health care system sub-structures, a previously published qualitative typology of health care system structure was utilized. The following section outlines the databases utilized in this analysis.

### 3.2.1 Measuring Social Capital - Indices of Social Development

The measurement of social capital has been achieved at both granular concept and index levels. However, there is considerable controversy over which proxy measure of social capital is the most accurate in capturing the essence of social capital. With the data available via publicly accessible surveys on the internet, an investigator can readily employ individual and community level responses to use membership in clubs and associations, enthusiasm in civic activism, intergroup dynamics, trust, minority inclusion, and gender equality in individual indicators or aggregate indices. Individual countries report these data through various academic and sociological portals, however there are few resources that have produced a coherent, multinational database that enables parsimonious cross-national comparisons of common denominator metrics. The International Institute of Social Studies (ISS) has produced an important tool in the measurement of social capital at the international level – the Indices of Social Development (ISD). (International Institute of Social Studies 2018)

The Indices of Social Development is a database of social capital indicator variables from over 190 countries from around the world (International Institute of Social Studies 2018). Rather than perform their own data collection, the ISD aggregates indicator variables from previously published sources such as the World Values Survey, CIVICUS, Global Civil Society Project, International Social Survey, Latinobarometer, Economist Intelligence Unit, Fund for Peace, Databanks, International Crime Victim Survey, World Development Indicators, Afrobarometer, and the International Country Risk Guide. From these survey tools, indicator variables have been extracted and cataloged over a time horizon of 1990 to 2010. Perhaps the most useful contribution of the ISD is the generation of indices for six major social capital domains: “Civic Activism,” “Clubs and Associations,” “Intergroup Cohesion,” “Interpersonal Safety and Trust,” “Gender Equality,” and “Inclusion of Minorities.” These indices were constructed using individual quantitative indicator variables available through the above-mentioned databases.

The ***Civic Activism*** index measures the magnitude of reported civic activism through behaviors and activities such as petitions, political demonstrations, levels of civic awareness, and participation in the media. Examples of indicator variables that comprise this index include:

- “Extent to which organisations and individuals in each country are members of INGOs, number of INGOs with members in that country,”
- “Newspapers per capita,”
- “Proportion of respondents who 'have done' or 'might' attend a peaceful demonstration,”
- “Percentage of the workforce employed in the NGO sector,” and
- “Proportion of respondents who have used internet or email in the last week to find out what is going on in the world.”

The ***Clubs and Associations*** index measures the membership of community members in volunteer groups, clubs, community meetings and gatherings, and other associations. This index includes both ‘bonding’ and ‘bridging’ social capital indicators. Examples of indicator variables contained within this index include:

- “Percentage respondents saying that people generally help one another in their neighbourhood,”
- “Proportion of respondents who are active or inactive members, church or religious organization,”
- “Proportion of respondents who are active or inactive members, other voluntary associations,”
- “Proportion of respondents who are active or inactive members, human rights organisations,” and
- “Spent time socialising with other members of arts or cultural association in last month or last few weeks.”

The ***Intergroup Cohesion*** index reflects cooperation and respect sentiments between groups in a community or society. Principally, the ISD curated indicator variables exploring intergroup discrimination, disparities, trust, civil disorder, and social instability. Examples of indicator variables contained within this index include:

- “Number of reported incidents of terrorist acts,”
- “Economist Intelligence Unit rating on likelihood of violent demonstrations,”
- “Rating on the ‘legacy of vengeance-seeking group grievance or group paranoia,”
- “Level of civil disorder, International Country Risk Guide rating,” and
- “Rating on the ‘legacy of vengeance-seeking group grievance or group paranoia.’”

The ***Interpersonal Safety and Trust*** index reflects metrics of general trust, trustworthiness, safety, security and probabilities of specific safety-related events such as homicide, robbery and extortion, and assault or physical attack. Examples of indicator variables contained within this index include:

- “Economist Intelligence Unit rating on social distrust,”
- “Percentage respondents feel 'very safe' or 'fairly safe' walking alone in their area after dark,”
- Proportion of respondents who do not very much or do not at all trust their neighbourhood,”
- “Proportion of respondents who do not very much or do not at all trust people they meet for the first time,” and
- “Percentage respondents experienced burglary in last 5 years.”

The ***Gender Equality*** index reflects metrics regarding gender parity with respect to employment, education, income and wages, domestic violence, and political power or influence. Examples of indicator variables contained within this index include:

- “Rating on level of women's economic rights”,
- “Rating on level of women's social rights”,
- “Proportion of employers and managers who agree or strongly agree that when jobs are scarce, men have more right to a job than women”,
- “Percentage of labour force that is female”, and
- “Ratio of females in professional jobs.”

The last index from the ISD included in this analysis is ***Inclusion of Minorities***. As the name suggests, this index quantifies attitudes and biases for and against minority inclusion in societal functions such as employment, benefits, and economic and social resource access. Examples of indicator variables contained within this index include:

- “Rating on level of uneven economic development along group lines,”
- “Level of religious tensions, International Country Risk Guide rating,”
- “Level of economic and political discrimination against minorities in country,”
- “Educational Disparity Ethnic Groups,” and
- “Level of ethnic tensions, International Country Risk Guide rating.”

### 3.2.2 International Health Care Spending & Utilization Database

The Organization for Economic Co-operation and Development (OECD) is an international consortium that seeks to provide evidence-based analysis and recommendations on several economic, industrial, social and welfare topics. Amongst their areas of expertise is health care spending, outcomes and utilization metrics. One of the most commonly cited health care spending indicators used in comparative analyses and outcomes reports is health care spending as a percentage (or share) of gross domestic product (GDP). (Organization for Economic Co-operation and Development 2016) Another commonly used spending indicator is health care dollars spent per capita in United States Dollars. However, only health care spending as a share of gross domestic product takes purchasing power into consideration. (Organization for Economic Co-operation and Development 2014) For the purposes of generalization, health care spending as a proportion of GDP in United States dollars, was obtained for each country included in this analysis.

In addition to annual health care spending measures, the OECD database also contains several utilization metrics with data provided across decades and hundreds of countries around the world. The utilization metrics comprise all facets of health care including surgical capacity, primary care outreach and availability, public health programs, disease burden, and mental health resources to name some prominent indicators. For this analysis, seven indicators with data reported by the countries with social capital index data were pulled (**Figure 3.1**). The indicators were selected based on their usefulness as a proxy for an interesting health care system function. For example, Appendectomy is usually an urgent procedure as a result of decompensated appendicitis and requires emergency surgery. Therefore, the appendectomy rate represents a measure of capacity of emergency surgery. The rates of hip replacements in a country's population is a common need for an elective surgery in an older population cohort and represents an indicator for capacity for elective, non-emergent surgery. Coronary bypass surgery is typically performed for a patient who has blocked coronary arteries. Coronary bypass surgery requires specialist cardiovascular surgeons as well as cardiac intensive care resources. Pediatric immunizations are often supplied, regulated, and/or monitored by regional or national governments or public health agencies. Immunizations – such as tetanus-diphtheria-pertussis (TDaP) – are therefore a proxy for public health programming. Computed tomography (CT) exams and magnetic resonance imaging (MRI) are advanced medical imaging technologies. While medically necessary in some cases, these technologies are expensive and have been the subject of overuse and a source of medical 'waste.' We elaborate on the links between medical waste and CT scans later in the case analysis section of this manuscript. It is worth noting that these proxy measures are imperfect, and subject to major assumptions regarding their generalizability. However, the OECD database did not have any other superior proxy variables to serve in the roles of healthcare utilization. We acknowledge that other variables exist outside of the OECD database that better serve generalizability. However, for the sake of consistency

and relying on the rigor of OECD data collection methods we did not introduce external, third-party variables into our analysis.

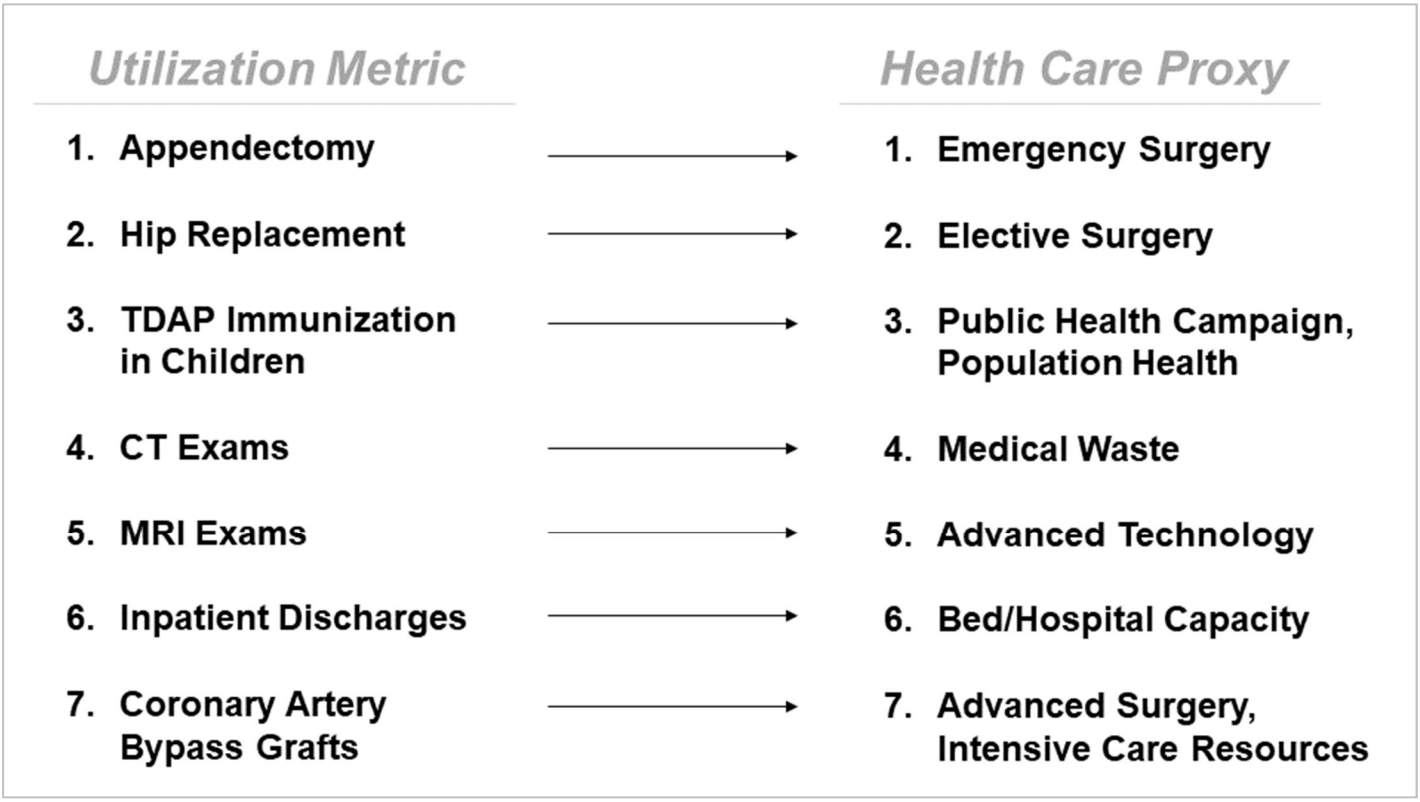


**Figure 3.1.** Figure demonstrating the association between health care metrics as proxies for specific health care system functions and capabilities. *TDAP: Tetanus-Diphtheria-Acellular Pertussis; CT: computed tomography, MRI: magnetic resonance imaging.*

## 3.3 ANALYTIC APPROACH

The availability of a high-quality, international health metric as well as a social capital index permits a robust quantitative approach to examining relationships between social capital and both health care system structure and function. The key component of the health care

function analysis is the use of the OECD utilization metrics that serve as different proxies for the capabilities of the health care system. The dependent variables for this analysis will be each utilization metric, whereas the independent variables will be each of the social capital indices described above. The rationale for each proxy is discussed further in the data description section in the first case analysis. For the structure analysis, the system structure typology will be relied upon to serve as the basis for the characterization of system type when associated with the social capital metrics. The health care system structure classifiers will serve as the dependent variables, and the social capital indices will be the independent variables.

Both correlation and regression modeling for both the health care function and structure analyses will be utilized. The rationale for using correlation analysis is to explore the one-on-one relationships between each of the dependent and independent variables. In this way, we begin to explore the data for significant associations. After the correlation analysis is completed, a formal regression analysis is completed. Regression analysis modeling is a robust predictive tool for quantifying the strength of association between different variables while at the same time controlling for the shared effects of all variables in the model. In the case of the health care utilization metric analysis, standard linear regression is used as both independent and dependent variables are considered continuous numeric. The regression model for the health system structure analysis will take on a different form as the dependent variables are nominal and multi-leveled. Therefore, a multinomial regression analysis will be used. In performing both correlation and regression analysis, I am hoping to bridge the gap between theory and evidence as social capital and health care system dynamics through a robust quantitative analysis.

All statistical analyses were completed using the ‘R’ statistical programming language (R Development Core Team (2008). R: A language and environment statistical computing. R Foundation for Statistical Computing, Vienna, Austria.)

### 3.4 ANALYSIS ASSUMPTIONS AND CONSTRAINTS

There are several assumptions and constraints in our analytic framework that potentially limit the generalizability of the results and subsequent conclusions. First and foremost, our database selection is a convenience sample. In an ideal research construct, primary data collection methods such as directly conducting the social capital survey and compiling health care utilization and spending data from each country would supply greater accountability for the data furnished for this analysis. However, the aim of this project was to provide an international health care systems' comparison with countries from all four corners of the world. As a result, primary data collection from each country was infeasible and impractical for the scope of this project. The second major constraint was our choice of for a quantitative associational approach. We are unable to comment on causality by demonstrating association. Causality could have been explored further through a randomized sample of survey respondents around the world. As the OECD and ISD do not supply individual-level data, we were unable to perform *post-hoc* randomization to expand our approach beyond association.

Additional assumptions are born out of the choice of each variable used in the case analyses. We used country-labeled social capital survey responses, utilization, and spending rate variables that generalizes the value for each variable to the entire country. There will be considerable variation for each of these variables within a given country. For example, the health utilization of certain health services may vary widely between rural and urban populations to use Canada as an example, it is common knowledge that specialist and subspecialist care is most often available in the tertiary academic health centers. In the province of Ontario, this means Ontarians must travel to one of the major cities (e.g. Toronto, Ottawa, London, Hamilton) in order to receive specialist care. This means that utilization of certain health services are consolidated into a handful of urban centers. Thus, health utilization may vary in direct proportion to the access and availability of health services in a given region. Moreover, the kinds

of health services needed may also differ across regions. Using the Ontario urban-rural dichotomy example, the relatively sparse population base in Northern Ontario may have different health care needs than that of urban Torontonians.

There may also be considerable variability in the responses to social capital survey questioning. The concepts tested in social capital surveys – trust, civic activism, cohesion, inclusion, gender equality – may mean different things to different people based on socioeconomic status, literacy, culture, race/ethnicity, or immigration status. The ISD purports to account for language and cultural differences in regional representations of their surveys, but this source of potential error remains. (International Institute of Social Studies 2018) Further interpretative error is introduced by generalizing the result of the social capital responses to an entire country. As a rule, the populace of a country is heterogeneous with respect to the modifiers listed above. Trust and safety may vary between urban, rural, prosperous and/or destitute abodes within a village, town, city, province or state. Using Canada as an example, there were over 250 ethnic origins represented in the 2016 population census (Statistics Canada 2017). As a result, we lose regional granularity within each variable by generalizing their results to represent an entire country. To take regional differences into account, future analyses will need a dataset that has respondent-level data.

Similarly, health care spending may be heterogenous in its distribution and amounts within a country. We used an aggregate measure of healthcare spending which does not account for where the health care dollars end up. For instance, depending on the health system the dollars ear-marked for health care may reside in a global budget that health authorities may use at their discretion. Alternatively, health spending may directly fund health care institutions, providers, pharmaceutical programs, or other direct health care resources. By using aggregate health spending, we are limiting our ability to directly associate health spending and funds directly available to furnish health services. Moreover, by standardizing health spending as a proportion

of a country's gross domestic product, we are introducing the prospect of market forces and monetary policy influencing the figure.

With respect to the health care system structure, we adopted Böhm's typology which carves up health care system structure into the substructures of regulation, provision, and financing. (Böhm et al. 2013) Health care systems are not static, and lumping them into a singular 'bucket' is an over-simplification. For example, the United States was labeled as 'private' health system with private actors presiding over each substructure. In contrast to this label, the United States harbors an entirely socialized health care system in the Veterans Health Administration that served 20.7 million veterans in 2017 – approximately 56% of the population size of Canada in the same year. (U.S. Department of Veteran's Affairs 2016) To further the point, health care systems are dynamic and evolving. A health system in Bohm's 2013 classification may shift to another type after health care reforms in this year or next. Having a strict hierarchy of health care system structure delineation enables clean analyses, but the retrospective categorization of system types might not hold in extrapolation to today's realities.

# 4.0 CASE ONE: SOCIAL CAPITAL AND COUNTRIES' HEALTH CARE SYSTEM FUNCTION

The following is the first of two case analyses in the exploration of an association between social capital and health care structure and function. As outlined previously, there is paucity of evidence published to date on the role of social capital and health care systems. To begin to explore how to leverage social capital in a national health policy strategy, an understanding of the mechanisms in which social capital influences health system structure and function is prudent. In this first case, I will explore the relationship between country-level social capital indices and health care system spending and utilization.

## 4.1 OBJECTIVE

The objective of this chapter is to provide a quantitative regression analysis exploring the association between social capital indices (independent variables) on health care spending (dependent variable), and selected health care system utilization metrics (dependent variables).

## 4.2 APPROACH

I have used a quantitative approach to first explore correlation between the variables. First, I have provided summary statistics for health care spending as a percentage of GDP for all countries with available data, as well as the countries' corresponding health care utilization metrics and social capital indices. Second, correlations were computed between all the variables under review. Lastly, linear regression was computed to generate a model to define the strength of the co-predictors acting upon the dependent variable. When relevant to the statistical test, countries with incomplete data were excluded.

## 4.3 DATA DESCRIPTION

As described in the methods chapter, I have obtained both national health care spending and utilization annual data from the OECD, as well as social capital indices from the ISD from 210 countries (**Table 4.1**). In this section, I will provide the summary statistics. Annual OECD health care spending data was used from 2000 to 2016. The ISD social capital data was available in 5-year increments from 1995 to 2010. Note, that the summary statistics indicate that the sample size for each variable is different. The OECD and ISD databases collect response from each county at different time intervals, and in some cases do not sample each country with every variable. There did not appear to be any systematic bias in the reporting trends, and the dispersion of variable capture rate appeared random. Therefore, to preserve the integrity of the analysis with varied sample sizes we performed pairwise-deletion when incomplete variable sets were present.

There are many health care utilization metrics available in the OECD database to choose from. Different metrics can serve as different 'proxies' for health care system function and capability (**Figure 3.1**). The rationale for the selection for each utilization metric is elaborated upon in the relevant data description. Considering a 'sicker' population may be more apt to use more health care resources, the relative burden of disease in the population (per capita) was included to control for the relative 'sickness' of the population when available. Unfortunately, the OECD database does not have burden of disease rates relevant to each of the health care utilization proxy measures included in this analysis. As a result, we are unable to control for the burden of disease when considering health service utilization. We opted to not use third-party rates to serve this purpose in the interest of consistency. The OECD purports to have rigorous and standardized data collection mechanisms, and introducing external rates would compromise the consistency of our data sources.

| | | | | |
|---|---|---|---|---|
| Afghanistan | Comoros | India | Monaco | Slovakia |
| Albania | Congo, Dem. Rep. | Indonesia | Mongolia | Slovenia |
| Algeria | Costa Rica | Iran, Islamic Rep. | Morocco | Solomon Islands |
| American Samoa | Cote d'Ivoire | Iraq | Mozambique | Somalia |
| Andorra | Croatia | Ireland | Myanmar | South Africa |
| Angola | Cuba | Isle of Man | Namibia | Spain |
| Antigua and Barbuda | Cyprus | Israel | Nepal | Sri Lanka |
| Argentina | Czech Republic | Italy | Netherlands | St. Kitts and Nevis |
| Armenia | Denmark | Jamaica | Netherlands Antilles | St. Lucia |
| Aruba | Djibouti | Japan | New Caledonia | St. Vincent & Grenadines |
| Australia | Dominica | Jordan | New Zealand | Sudan |
| Austria | Dominican Republic | Kazakhstan | Nicaragua | Suriname |
| Azerbaijan | Ecuador | Kenya | Niger | Swaziland |
| Bahamas, The | Egypt, Arab Rep. | Kiribati | Nigeria | Sweden |
| Bahrain | El Salvador | Korea | Northern Mariana Islands | Switzerland |
| Bangladesh | Equatorial Guinea | Korea, Dem. Rep. | Norway | Syrian Arab Republic |
| Barbados | Eritrea | Kuwait | Oman | Taiwan, China |
| Belarus | Estonia | Kyrgyz Republic | Pakistan | Tajikistan |
| Belgium | Ethiopia | Lao PDR | Palau | Tanzania |
| Belize | Faeroe Islands | Latvia | Panama | Thailand |
| Benin | Fiji | Lebanon | Papua New Guinea | Timor-Leste |
| Bermuda | Finland | Lesotho | Paraguay | Togo |
| Bhutan | France | Liberia | Peru | Tonga |
| Bolivia | French Polynesia | Libya | Philippines | Trinidad and Tobago |
| Bosnia and Herzegovina | Gabon | Liechtenstein | Poland | Tunisia |
| Botswana | Gambia, The | Lithuania | Portugal | Turkey |
| Brazil | Georgia | Luxembourg | Puerto Rico | Turkmenistan |
| Brunei Darussalam | Germany | Macao, China | Qatar | Uganda |
| Bulgaria | Ghana | Macedonia, FYR | Romania | Ukraine |
| Burkina Faso | Greece | Madagascar | Russia | United Arab Emirates |
| Burundi | Greenland | Malawi | Russian Federation | United Kingdom |

| | | | | |
|---|---|---|---|---|
| Cambodia | Grenada | Malaysia | Rwanda | United States of America |
| Cameroon | Guam | Maldives | Samoa | Uruguay |
| Canada | Guatemala | Mali | San Marino | Uzbekistan |
| Cape Verde | Guinea | Malta | Sao Tome and Principe | Vanuatu |
| Cayman Islands | Guinea-Bissau | Marshall Islands | Saudi Arabia | Venezuela, RB |
| Central African Republic | Guyana | Mauritania | Senegal | Vietnam |
| Chad | Haiti | Mauritius | Serbia and Montenegro | Virgin Islands (U.S.) |
| Channel Islands | Honduras | Mayotte | Seychelles | West Bank and Gaza |
| Chile | Hong Kong, China | Mexico | Sierra Leone | Yemen, Rep. |
| China | Hungary | Micronesia | Singapore | Zambia |
| Columbia | Iceland | Moldova | Slovak Republic | Zimbabwe |

**Table 4.1.** List of countries contained within the study database.

### 4.3.1 Health Care Spending

The countries' mean health care spending and social capital index values were calculated with their standard deviation, 25$^{th}$ percentile, 75$^{th}$ percentile and values range (**Table 4.2**). The number of observations exceeded 210 countries as multiple years of data were available for each.

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Health Care Spending (% of GDP) | 732 | 7.86 | 2.25 | 1.81 | 6.25 | 9.22 | 17.2 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.2.** Summary statistics of the national health care system spending and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

### 4.3.2 Health Care Utilization

The countries' mean utilization for selected health care utilization metrics were computed with their standard deviation, 25$^{th}$ percentile, 75$^{th}$ percentile and values range. The social capital indices were computed as well. Note, the summary statistics for the social capital indices differ from their corresponding values in the health care spending analysis due to the exclusion of countries with incomplete data.

#### *4.3.2.1 Utilization Metric: Appendectomy Procedures per 100,000 citizens*

An appendectomy is a general surgical procedure that is performed when an individual has 'appendicitis' – acute inflammation of the appendix. An appendectomy is typically an unplanned and/or emergent procedure due to potentially life-threatening appendicitis. The summary statistics for the total number of 'appendectomy procedures per 100,000 inhabitants' in each country were computed (**Table 4.3**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Appendectomy total procedures per 100,000 inhabitants | 367 | 131.50 | 35.22 | 65.60 | 104.80 | 154.70 | 240.90 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.3**. Summary statistics of the 'appendectomy per 100,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

#### *4.3.2.2 Utilization Metric: Coronary Artery Bypass Graft per 100,000 inhabitants*

A coronary artery bypass graft is an invasive surgical procedure that is performed when an individual requires diversion of blood flow through the coronary arteries of the heart after a blockage of the coronaries has or will result in an acute myocardial infarction (heart attack). A

coronary artery bypass graft requires the expertise of a cardiothoracic surgeon, as well as large hospital with intensive care unit capabilities. The summary statistics for the total number of 'coronary artery bypass graft procedures per 100,000 inhabitants' from each country were computed (**Table 4.4**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Coronary artery bypass graft total procedures per 100,000 inhabitants | 370 | 47.45 | 21.88 | 1.30 | 34.63 | 61.18 | 132.00 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.032 | 0.54 | 0.67 | 0.78 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.4**. Summary statistics of the 'coronary artery bypass graft per 100,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

### *4.3.2.3 Utilization Metric: Hip Replacement Procedures per 100,000 inhabitants*

A hip replacement is an invasive surgical procedure that is performed when an individual requires replacement of the hip joint. A hip replacement requires the expertise of an orthopedic surgeon, as well as a medium to large hospital. Hip replacements can be emergent, but are most often elective. The summary statistics for the total number of 'hip replacement procedures per 100,000 inhabitants' from each country were computed (**Table 4.5**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Total Hip replacement Procedures per 100 000 inhabitants | 373 | 153.31 | 72.20 | 4.00 | 102.6 | 215.0 | 299.3 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.5**. Summary statistics of the 'hip replacement procedures per 100,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

#### *4.3.2.4 Utilization Metric: Percent of Children Immunized Against Tetanus, Pertussis, and Diphtheria (TDaP).*

Immunization against tetanus, pertussis, and diphtheria is the standard of care for children as part of the pediatric immunization battery. These three diseases are of great public health importance given their high virulence and potential morbidity if left untreated. The summary statistics for the total number of percent of children immunized against tetanus, pertussis, and diphtheria from each country were computed (**Table 4.6**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| TDaP Immunization % of children immunized | 704 | 93.95 | 6.09 | 58.0 | 92.0 | 98.0 | 99.0 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.6**. Summary statistics of the 'percent of children immunized against TDaP' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

### *4.3.2.5 Utilization Metric: Computed Tomography Exams per 1,000 inhabitants*

A computed tomography (CT) scan is a diagnostic imaging modality that provides cross-sectional images using x-ray radiation. A CT scan is one of the most commonly employed diagnostic imaging modalities with applications for imaging every part of the human body. CT imaging technology is often the posterchild for overutilization of an expensive medical technology in certain clinical decision-making resulting in excess health care waste and expenditures. The evidence for CT imaging overuse will be elaborated on further in the discussion. The summary statistics for the total number of 'CT exams per 1,000 inhabitants' from each country were computed (**Table 4.7**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Total Computed Tomography exams per 1,000 inhabitants | 257 | 124.78 | 70.96 | 22.50 | 79.50 | 157.20 | 585.20 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.7**. Summary statistics of the 'CT exams per 1,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

#### *4.3.2.6 Utilization Metric: Magnetic Resonance Imaging Exams per 1,000 inhabitants*

A magnetic resonance imaging (MRI) scan is a diagnostic imaging modality that provides cross-sectional images using high-powered magnets. An MRI scan is less commonly employed that CT scans, but it is also used to image any part of the human body. MRI imaging technology can also be 'overused' leading to excess health care waste and expenditures. One of the major differences between CT and MRI scanners is that MRI scanners are considerably more expensive to operate. The summary statistics for the total number of 'MRI exams per 1,000 inhabitants' from each country were computed (**Table 4.8**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Total Magnetic Resonance Imaging Exams Per 1,000 inhabitants | 258 | 47.56 | 30.45 | 3.10 | 24.23 | 67.58 | 144.30 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.8**. Summary statistics of the 'MRI exams per 1,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

### *4.3.2.7 Utilization Metric: Inpatient Discharges per 100,000 inhabitants*

The number of inpatient discharges relative to a inhabitants unit represents the number of inhabitants who were admitted to a hospital for any medical condition and later were discharged after resolution or treatment of the condition. This metric represents both the utilization and availability of hospitals to treat conditions that require more resources than simple, self-limited ailments. The summary statistics for the total number of 'inpatient discharges per 100,000 inhabitants' from each country were computed (**Table 4.9**).

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Inpatient care discharges per 100 000 inhabitants | 563 | 15,941.7 | 5,243.7 | 2,164.9 | 12,914.7 | 18,881.6 | 28,114.5 |
| Civic Activism Index | 863 | 0.50 | 0.10 | 0.13 | 0.45 | 0.54 | 0.88 |
| Intergroup Cohesion Index | 595 | 0.60 | 0.10 | -0.03 | 0.54 | 0.67 | 0.79 |
| Clubs & Associations Index | 468 | 0.50 | 0.10 | 0.14 | 0.44 | 0.56 | 0.86 |
| Interpersonal Safety & Trust Index | 540 | 0.50 | 0.10 | 0.23 | 0.44 | 0.56 | 0.77 |
| Gender Equality Index | 888 | 0.70 | 0.10 | 0.21 | 0.64 | 0.75 | 1.02 |
| Inclusion Index | 421 | 0.50 | 0.10 | 0.17 | 0.44 | 0.54 | 0.90 |

**Table 4.9**. Summary statistics of the 'Inpatient Discharges per 100,000 inhabitants' utilization metric and social capital indices included in the regression analysis**.** *St Dev: standard deviation.*

## 4.4 RESULTS

This section presents the results from the correlation and regression models for each of the health care spending and health care utilization analyses.

### 4.4.1 Health Care Spending

Prior to the linear regression modeling, exploratory analysis including paired correlation was used to identify significant correlation between the variables (**Table 4.10**). This was completed using Pearson correlation and listwise-deletion to exclude cases where incomplete data was present. Four of the six social capital indices had statistically significant positive correlations with health care spending. The highest of which were inclusion (0.61), and intergroup cohesion (0.56).

A linear regression model (ii) was successfully generated with a good fit (adjusted $R^2$ = 0.47) (**Table 4.11**):

i) $Y = B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_0$

ii) Health Spending % $= 9.1X_1 + 4.3X_2 + 1.2X_3 - 4.2X_4 + 2.3X_5 + 11.8X_6 - 6.6$

$X_1$: Civic Activism Index

$X_2$: Intergroup Cohesion Index

$X_3$: Clubs & Associations Index

$X_4$: Interpersonal Safety & Trust Index

$X_5$: Gender Equality Index

$X_6$: Inclusion Index

| | *Health Care Spending (% of GDP)* | *Civic Activism Index* | *Intergroup Cohesion Index* | *Clubs & Associations Index* | *Interpersonal Safety & Trust Index* | *Gender Equality Index* | *Inclusion Index* |
|---|---|---|---|---|---|---|---|
| *Health Care Spending (% of GDP)* | | | | | | | |
| *Civic Activism Index* | 0.521<br>*(<.001)* | | | | | | |
| *Intergroup Cohesion Index* | 0.559<br>*(<.001)* | 0.324<br>*(.001)* | | | | | |
| *Clubs & Associations Index* | 0.160<br>*(.105)* | 0.327<br>*(.001)* | 0.092<br>*(.357)* | | | | |
| *Interpersonal Safety & Trust Index* | 0.188<br>*(.058)* | 0.520<br>*(<.001)* | 0.069<br>*(.487)* | 0.227<br>*(.021)* | | | |
| *Gender Equality Index* | 0.495<br>*(<.001)* | 0.307<br>*(.002)* | 0.743<br>*(<.001)* | 0.023<br>*(.821)* | 0.084<br>*(.399)* | | |
| *Inclusion Index* | 0.606<br>*(<.001)* | 0.688<br>*(<.001)* | 0.530<br>*(<.001)* | 0.143<br>*(.150)* | 0.556<br>*(<.001)* | 0.445<br>*(<.001)* | |

*Computed correlations used Pearson-method with listwise-deletion.*

**Table 4.10**. Correlation matrix of national health care spending data and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

Collinearity diagnostics were performed by generating the variation inflation factors (VIF) for the regression model parameters. There was no evidence of collinearity as each co-predictor in the model had a VIF of less than 3 (not shown). In the regression model, increases in both the civic activism and inclusion social capital indices result in an increase in health spending. The effect size is largest with the inclusion index ($B_6$ = 11.8).

| | **Health Care Spending as % of GDP** | | |
|---|---|---|---|
| | *B* | *CI* | *p* |
| *(Intercept)* | *-6.60* | *-10.14 – -3.07* | *<.001* |
| **Civic Activism Index** | **9.14** | **0.99 – 17.29** | **.028** |
| Intergroup Cohesion Index | 4.29 | -0.66 – 9.23 | .088 |
| Clubs & Associations Index | 1.18 | -2.62 – 4.98 | .540 |
| Interpersonal Safety & Trust Index | -4.16 | -8.53 – 0.21 | .062 |
| Gender Equality Index | 2.25 | -1.90 – 6.40 | .284 |
| **Inclusion Index** | **11.80** | **3.98 – 19.63** | **.003** |
| Observations | | 103 | |
| $R^2$ / adj. $R^2$ | | .498 / .467 | |

**Table 4.11**. Linear regression model for national health care system spending and social capital indices**.**
B: *regression coefficient; CI: confidence interval, p: p-value.*

A second linear model was generated through the elimination of the non-significant co-predictors (iii), however this model produced an inferior fit (adjusted $R^2$ = 0.33) (**Table 4.12**).

iii) Health Spending % $= 8.5X_1 - 6.0X_2 + 15.4X_3 - 2.0$

$X_1$: Civic Activism Index

$X_2$: Interpersonal Safety & Trust Index

$X_3$: Inclusion Index

| | **Health Care Spending as % of GDP** | | |
|---|---|---|---|
| | *B* | *CI* | *p* |
| *(Intercept)* | *-2.04* | *-5.15 – 1.08* | *.198* |
| **Civic Activism Index** | **8.49** | **0.46 – 16.53** | **.038** |
| **Interpersonal Safety & Trust Index** | **-6.03** | **-10.31 – -1.74** | **.006** |
| **Inclusion Index** | **15.35** | **8.50 – 22.21** | **<.001** |
| Observations | | 114 | |
| $R^2$ / adj. $R^2$ | | .345 / .327 | |

**Table 4.12**. Trimmed linear regression model for national health care system spending and social capital indices**.** B: *regression coefficient; CI: confidence interval, p: p-value.*

### 4.4.2 HEALTH CARE UTILIZATION

Prior to the linear regression modeling, exploratory analysis including paired correlation was used to identify significant correlation between the variables. This was completed using Pearson correlation and listwise-deletion to exclude cases where incomplete data was present. None of the social capital indices were significantly correlated with the appendectomy procedures (**Appendix A**).

- ***Civic activism*** was positively correlated with coronary artery bypass procedures (0.48), hip replacement procedures (0.62), and MRI exams (0.49).
- ***Intergroup cohesion*** was positively correlated with hip replacement procedures (0.44), children's TDAP immunization (0.38), and inpatient discharges (0.23).
- ***The clubs and associations index*** was positively correlated with coronary artery bypass procedures (0.42), hip replacement procedures (0.56), CT exams (0.51), and MRI exams (0.62). This index was negatively correlated with children's TDAP immunization (-0.19).
- ***The interpersonal safety and trust index*** was positively correlated with coronary artery bypass procedures (0.42), hip replacement procedures (0.56), MRI exams (0.38), and inpatient discharges (0.36).
- ***The gender equality index*** was positively correlated with children's TDAP immunization (0.33)., and inpatient discharges (0.22).
- ***The inclusion index*** was positively correlated with hip replacement procedures (0.55), and children's TDAP immunization (0.25).

Multiple linear regression models were completed exploring the relationship between the utilization metrics and the social capital indices. The model is expressed in general terms in equation (1) and the specific health care utilization proxies are reflected in equations (2) through

(7). Collinearity diagnostics were performed by generating the variation inflation factors (VIF) for the regression model parameters. There was no evidence of collinearity as each co-predictor in the model had a VIF of less than 3 (not shown). The results of the models are displayed in a composite table presented below (**Table 4.13**). The confidence intervals are suppressed for readability. To control for the health of the population, the rate of circulatory diseases per 100,000 inhabitants was used in the coronary artery bypass graft regression. A specific and relevant metric of population health to control for in the appendectomy, hip replacements, and diagnostic imaging regression sets was not available.

(1) $Y = B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_0$

Co-predictor variables:

$X_1$: Civic Activism Index

$X_2$: Intergroup Cohesion Index

$X_3$: Clubs & Associations Index

$X_4$: Interpersonal Safety & Trust Index

$X_5$: Gender Equality Index

$X_6$: Inclusion Index

(2) Appendectomies per 100,000 Inhabitants

$$= 219.7X_1 + 178.7X_2 - 140.7X_3 + 111.0X_4 - 121.6X_5 - 187.14X_6 + 97.6$$

(3) Hip Replacements per 100,000 Inhabitants

$$= 752.9X_1 + 481.2X_2 + 57.8X_3 + 233.2X_4 - 246.4X_5 + 72.9X_6 - 604.8$$

(4) TDAP % of Children Immunized

$$= 43.4X_1 + 22.0X_2 - 21.8X_3 - 30.0X_4 + 1.33X_5 + 13.5X_6 + 73.3$$

(5) CT Exams per 1,000 Inhabitants

$$= 227.1X_1 + 239.3X_2 + 354.3X_3 - 369.6X_4 + 48.6X_5 - 230.3X_6 - 94.2$$

(6) MRI Exams per 1,000 Inhabitants

$$= 135.7X_1 + 158.3X_2 + 138.6X_3 + 15.9X_4 - 54.5X_5 - 98.3X_6 - 128.4$$

(7) Inpatient Discharges per 100,000 Inhabitants

$$= 16{,}103.4X_1 + 12{,}642.5X_2 - 20{,}006.0X_3 + 32{,}029.3X_4 + 8{,}644.8X_5$$

$$- 27{,}263.4X_6 - 1{,}401.7$$

(8) Coronary Artery Bypass Grafts per 100,000 Inhabitants

$$= 166.3X_1 - 17.8X_2 + 30.6X_3 + 81.1X_4 - 36.4X_5 + 18.1X_6 + 0.01X_7 - 96.3$$

$X_7$ in this model represents the additional variable '*Diseases of the Circulatory System, Per 100,000 Inhabitants*.'

Of the regression models, all health care utilization metrics had at least one significant positive association with a social capital index except for the appendectomy procedure metric which failed to have a significant association. The regression model with the best overall fit included the hip replacement procedure metric (adjusted $R^2 = 0.56$), followed by the coronary artery bypass graft procedure metric (adjusted $R^2 = 0.40$).

| | Appendectomy Total per 100,000 Inhabitants | | Hip Replacement Total per 100,000 Inhabitants | | TDAP % of children Immunized | | CT Exams Total Per 1,000 Inhabitants | | MRI Exams Total Per 1,000 Inhabitants | | Inpatient Discharges Per 100 000 Inhabitants | | Coronary Artery Bypass Graft Total per 100,000 Inhabitants | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *p* | *B* | *p* | *B* | *p* | *B* | *p* | *B* | *p* | *B* | *p* | *B* | *p* |
| *(Intercept)* | 97.6 | .209 | -604.8 | <.001 | 73.3 | <.001 | -94.2 | .577 | -128.4 | .087 | -1,401.7 | .858 | -96.3 | .011 |
| Civic Activism Index | 219.7 | .212 | **752.9** | **.002** | **43.4** | **.014** | 227.1 | .488 | 135.7 | .342 | 16,103.4 | .390 | **166.3** | .043 |
| Intergroup Cohesion Index | 178.7 | .063 | **481.2** | **<.001** | **22.0** | **.011** | 239.3 | .298 | 158.3 | .117 | 12,642.5 | .169 | -17.8 | .730 |
| Clubs & Associations Index | -140.7 | .089 | 57.8 | .581 | **-21.8** | **.003** | **354.3** | **.011** | **138.6** | **.020** | **-20,006.0** | **.011** | 30.6 | .494 |
| Interpersonal Safety & Trust Index | 111.0 | .351 | 233.2 | .133 | **-30.0** | **<.001** | -369.6 | .101 | 15.9 | .868 | **32,029.3** | **<.001** | 81.1 | .142 |
| Gender Equality Index | -121.6 | .121 | **-246.4** | **.016** | 1.33 | .870 | 48.6 | .716 | -54.5 | .351 | 8,644.8 | .270 | -36.4 | .376 |
| Inclusion Index | -187.1 | .201 | 72.9 | .699 | 13.5 | .362 | -230.3 | .395 | -98.3 | .402 | -27,263.4 | .069 | 18.1 | .812 |
| Diseases of the Circulatory System , Per 100,000 Inhabitants | | | | | | | | | | | | | 0.01 | **.003** |
| Observations | 58 | | 57 | | 108 | | 35 | | 35 | | 85 | | 55 | |
| $R^2$ / adj. $R^2$ | .130 / .028 | | .608 / .561 | | .326 / .286 | | .379 / .246 | | .443 / .323 | | .271 / .215 | | .479 / .402 | |

**Table 4.13**. Composite linear regression models for national health care system utilization metrics and social capital indices**. Coefficients with** significant p-values bolded for emphasis. B: *regression coefficient, p: p-value.*

## 4.5 DISCUSSION

The quantitative analysis for this case produced intriguing results when exploring the associations between health care spending and utilization with social capital indices. Across both metrics, there is evidence to suggest that countries with higher indices of social capital predict higher health care spending and utilization. However, the conclusion with health care utilization is nuanced with a few instances where increases in social capital indices resulted in decreased utilization. In this section, I will interpret these results in context of the theoretical connections between social capital health care spending and utilization.

One of the vexing assumptions in understanding the relationship between the social capital indices and the health care system function metrics is grounded in the assertion that each social capital index represents a different form of social capital. As I introduced earlier, all social capital is not equal as social capital takes different forms in different contexts. One of the preeminent social capital typologies is the delineation of social capital into 'bridging,' and 'bonding' social capital. Bridging capital may be best represented by the ISD social capital indices of intergroup cohesion, gender equality, and inclusion given that bridging capital is described as forging connections between disparate and otherwise heterogeneous groups with varying values, beliefs, goals and intentions (**Figure 4.1**). Bonding capital represents the strength of the bond of similarity. The similarity might manifest as a singular community whom share a connection in geography or demographic, or through hobbies (such as Putnam's 'bowling leagues') and political interests. The ISD social capital indices that might best represent bonding capital are 'clubs & associations' and 'interpersonal safety and trust.' (**Figure 4.1**). 'Civic activism' is the lone social index without an obvious social capital classification. Civic activism could take either form of bridging or bonding social capital based on the context. For instance, an interest group might be politically active for a very narrow and specific political goal or function – this is more aligned with bonding capital as the strength of the interest group lies in

the common bond. Conversely, political activity may be performed in the spirit of linking separate interest groups or initiatives for the common good. One could make the argument for context in each of the six social capital indices, but the above interpretation would likely make a compelling case for consensus.


**Figure 4.1**. The ISD social capital indices distributed over the bridging-bonding social capital spectrum.

A challenge in assigning a specific social capital typology – such as bonding or bridging – is that the creators of the index did not intend on assigning classifiers when the measures that aggregate to form the indices were determined. This produces the opportunity for heterogeneity in the meaning of the index, and a weakness in the assumption that one index can holistically represent bonding or bridging social capital. Thus, this produces a major limitation that inhibits drawing conclusions between the effect size or direction of correlation and association of the social capital index with the health care system function. Given the considerable controversy surrounding the definitions and applications of social capital to research and analysis, there is no consensus on how to ameliorate this limitation at present. Despite this limitation, this analysis presents novel data to suggest that increased national health care spending and utilization are associated with higher social capital index ratings.

The social capital indices of civic activism, intergroup cohesion, gender equality, and inclusivity were all positively correlated with health care spending. As stated above, these indices best reflect bridging capital with the contextual exception of civic activism. If we envision a country with high bridging social capital, we might expect this country to have an outward and progressive approach to social welfare. That is, inhabitants and interest groups can look beyond their differences to collectively pursue goals for mutual benefit. Moreover, a politically active populace is more apt to 'fight' for policy reform for issues of importance. One of the major pillars of social welfare is public health. Therefore, the fact that bridging social capital and higher health spending is not surprising. Of course, the debate on the merits and return on investment of higher spending on health care precludes us from concluding that higher spending equals better health. The United States is a prime example how high spending does not translate to better health outcomes. (Squires and Anderson 2013, pp. 12–13) Nonetheless, spending that is too low also results in adverse population health outcomes as in the case in Canada explained earlier in this analysis. (Crémieux et al. 1999, p. 638)

In the regression model for health care spending, civic activism and inclusivity where statistically significant positive predictors of health care spending. This result supports the hypothesis above that the spirit of bridging social capital might positively influence health care spending. As governments often determine the amount and proportions of national health care spending, we cannot divorce the effect of social capital and political institutions at the core of the countries in this analysis. This will be explored further in the second case of this project in the exploration of health care system structure and social capital.

The relationship between the health care utilization and social capital is more nuanced. With respect to correlation between utilization and social capital, all six of the indices had a statistically significant positive correlations with a utilization metric. Only the '*clubs and associations'* index harbored a statistically significant negative correlation with the TDaP

utilization metric. This was an interesting finding given clubs and associations' bonding capital classification. The TDaP immunization is a widely accepted component of both pediatric and adult immunization schedules as it is an effective preventative measure against tetanus, diphtheria, and acellular pertussis. Diphtheria and acellular pertussis are highly contagious and sometimes fatal bacterial infections that once ravaged the world before the advent of antibiotics and their respective vaccines. These illnesses still inflict serious harm to vulnerable populations in countries with immature or underdeveloped population health programs. In this analysis, the TDaP immunization utilization metric was used as a proxy for public health. Presumably, higher TDaP immunization rates in children represent an effective vaccination and robust pediatric primary care. The relationship between higher bonding social capital and relatively lower TDaP immunization rates might represent a dampening effect of bonding capital on national public health interests. If this were the case, we might have expected to see 'clubs and associations' serving as a negative predictor of health care spending. However, health care spending is a broad metric that includes all facets of care beyond that of public health programs. I cannot elaborate further on this hypothesis with the data provided, however it provides an interesting research question for further study.

At first glance, the regression models for health care utilization metrics produced some results that disagreed. When looking at the 'Hip Replacement' metric representing an elective operative procedure typically performed in the adult and geriatric population segment, the bridging indices of civic activism and intergroup cohesion were associated with higher relative hip replacement rates. The bridging social capital index of gender equality was associated with relatively less hip replacement rates. That is, higher gender equality results in fewer hip replacements. An obvious explanation for this finding is elusive. However, an interesting report on the differences in gender-based utilization of hip replacement from Ontario may lend a hint to the explanation. In a survey-based study of Ontario residents age 55 years or older, the authors

reported that “despite their equal willingness to have the surgery, fewer women than men had discussed the possibility of arthroplasty with a physician (adjusted odds ratio, 0.63)…numbers of people with a potential need for hip or knee arthroplasty were 44.9 per 1000 among women and 20.8 per 1000 among men.” (Hawker et al. 2000) Thus, there is lower utilization of hip replacements in a province of a country with progressive record on gender equality relative to other countries worldwide.

In the regression model, the relationship between bonding and bridging social capital as it related to TDaP immunization rates echoed the correlation analysis. Both bonding social capital indices predicted relatively less TDaP immunization rates, whereas intergroup cohesion bridging index and the contextual civic activism index predicted higher TDaP immunization rates. The latter association of higher civic activism predicting TDaP immunization rates appears intuitive. Medical conditions of public health importance – such as contagious bacterial infections that spread quickly in a vulnerable population – often achieve greater visibility and exposure. The regression result for ‘coronary artery bypass graft’ utilization metric echoes this. Acute myocardial infarctions (heart attacks) are one of the leading killers of adults in developed countries. Higher bridging social capital was associated with higher utilization rates of this life-saving procedure. As introduced above, the direct mechanism of bonding social capital on public health programming is a question idea worthy of further study. Similarly, higher bonding social capital in the form of the ‘clubs and associations’ index predicted lower hospital discharge rates.

Williams’ landmark paper on the influence of social capital on physician professional behaviors was among the first to suggest that regions with higher health care utilization due to self-interested behavior (such as income or convenience driven) of physicians was related to lower social capital. (Williams 2012) However, Williams admitted that “we cannot tell whether ‘bonding’ or ‘bridging’ social capital is at work … social capital theory fails to distinguish

precisely the mechanism at work driving a normatively unsatisfactory outcome." (Williams 2012, p. 337) I provide evidence to both support and extend his hypothesis through the regression models for CT and MRI scanning – both utilization metrics were enhanced only by higher bonding social capital. CT and MRI scans are a useful, yet expensive diagnostic imaging modality. Considerable research has evaluated the utilization of CT and MRI scanning given their expense, and they have arrived at similar conclusions – they are often overused in many clinical scenarios leading to excessive costs and potential adverse health outcomes related to complications from the processes involved in the imaging techniques. (Bogdanich and Craven McGinty 2011; Emery et al. 2013; Redberg and Smith-Bindman 2014) national taskforces have been erected to find the root-cause of this overuse, and efforts are ongoing to propagate evidence-based guidelines to curb utilization. (Mathias and Baker 2013) Therefore, higher utilization of CT and MRI scans is not necessarily a good thing for a national health system. Perhaps higher bonding social capital may be at play for self-interested or inappropriate clinician behavior patterns that result in higher CT or MRI utilization rates in line with Williams' conclusions. It is entirely possible that certain interest groups that directly benefit from higher CT and MRI utilization rates are key factors. An interesting further study question will be to further characterize bonding social capital that may be at play within the radiology community and for-profit health systems that observe significant renumeration with higher volumes of CT and MRI scans.

The last regression results worthy of discussion produced a result that defies explanation. The rate of hospital discharges is a proxy for the capacity and throughput of a health system. Given my arguments above, one would think higher capacity would be associated in a robust health care system with higher bridging social capital. For the 'hospital discharge' metric, the bonding social capital indices of 'clubs and associations' and 'interpersonal safety and trust' disagreed. Disagreement between two bonding social capital

indices may be an anomaly in the data considering that this observed relationship does not fit the tension inherent to the bonding-bridging dichotomy. Nonetheless, it also demonstrates that the forces at play with social capital and health care system function are complex and much more intricate than what I can quantitatively explore with the available data.

In conclusion, it appears higher national ratings on bridging social capital indices are predictive of higher health care spending. Countries with high bridging social capital, might have progressive health care polices rooted in a population that is able to look beyond their differences to collectively pursue the goal of better health for mutual benefit. With respect to utilization, a trend emerged whereby bridging social capital was associated with higher utilization of public health and essential service health system functions, and bonding social capital with less utilization in the case of public health immunizations. These results extend the conclusions laid down by Williams linking the level of social capital as it relates to regional health care utilization. We have yet to introduce the role of political institutions and government in health and social capital. The last major component of a health system – its structure – will be explored in the next case.

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## 5.0 CASE TWO: SOCIAL CAPITAL AND HEALTH CARE SYSTEM STRUCTURE

The following is the last case analysis in the exploration of an association between social capital and health care structure and function. In the first case, I explored the relationship between social capital indices and health care system spending and utilization. In this case, the association between national health care system structure and social capital indices is explored.

Relevant to this chapter's approach to examining health care system structure and social capital is an exploration of the nature and contribution of political institutions. Health care systems are structured in part through political action, civic participation, and regulation. The amount of political involvement may vary, but it is an inseparable component of health care system structure. Even in the completely private system of the United States, the government has a vested interest – and role – in defining and sculpting the structure of its health care system. In this section, I will briefly introduce the contribution and variable commitment of political entities to health care.

As health care systems are almost invariably influenced or managed by governmental forces to an extent, it is impossible to divorce political institutions from health care system structure. Even in the pure '*Private'* health care system of the United States with all three system substructures dominated by private entities, the government has both the power and interest in shaping health care system structure through welfare programs and policy. The study of public welfare is a field unto itself. A welfare state "implies a social contract with the citizenry" whereby the state facilitates or outright produces welfare mechanisms for its populace. (Esping-Andersen 2002, pp. 7–8) The production of welfare for a citizenry has been neatly delineated by Esping-Anderson as a tri-pillar arrangement of markets, familial, and government production. (Esping-Andersen 2002, pp. 11–12) Health care likely receives contributions from all three pillars with state-driven systems residing more in the governmental pillar, whereas health care systems with heavy private investment have a more mixed contribution with market influences.

A classic example is that of the Scandinavian countries whom rely heavily upon the government mode for welfare production. (Esping-Andersen 2002, p. 13) Such countries have welfare policies in place such as universal income guarantees, and tight safety nets for children and the elderly. With respect to health care, the governmental welfare manifests as universal or broad coverage for necessary medical services from the cradle to the grave.

As the OECD countries have been classified according to different health care system types based on the composition of the systems' subunits, so have their political institutions. There are different methods for binning countries into political types or 'styles' using different typologies. The approach used by Esping-Andersen and colleagues is to group countries in regional traditions. (Esping-Andersen 2002, p. 13) Such regions include 'the Nordic' described previously, the liberal welfare model of Ireland and the UK, and the 'Continental European Welfare Model' represented by southern European countries. (Esping-Andersen 2002, p. 13) However, this approach fails to consider the remaining countries in this analysis that includes countries from North and South America, Africa, and South Asia. Therefore, an additional all-inclusive typology that includes might be more appropriate. One such typology is Navarro's classification of political traditions of the OECD countries. From 1950 to 2000, four main polities have dominated the OECD countries: social democratic, Christian democratic, liberal, and authoritarian democratic. (Navarro et al. 2006, p. 1033) Each of these polities have different propensities for distributing wealth amongst the population – meaning there is greater wealth distribution in social democratic societies versus authoritarian. From this analytic perspective, political traditions with greater wealth distribution generated greater health outcomes in a study by Navarro et al.. (Navarro et al. 2006, p. 1035) The main mechanisms that produce the positive effect on health are thought to be sourced from both egalitarian welfare state and labor market policies. (Navarro et al. 2006, p. 1035) What's more, the longer a country harbored a pro-wealth distribution political tradition, the more likely progressive social welfare policies such as

universal health care and social benefits coverages were in place. (Navarro et al. 2006, p. 1036) Thus, it is therefore plausible that socially progressive political traditions introduce egalitarian polices that in turn enhance social capital. Next, enhanced social capital either directly enhances health outcomes or is at least a bystander to the terminal effect of the cascade of wealth distribution. The topic of politics and health care system structure is a separate subject unto itself, but the policy-making behaviors of specific political traditions may be key in interpreting how social capital might influence health care system structure.

Health care system structures are fluid and subject to many forces including the economy, shifts in government policy, and the values of the populace. It is possible that a national health system could shift from one system type to another. For instance, health reform proponents in the United States have been loudly calling for universal health care coverage in the since the early 2000s. The movement picked up steam during President Barack Obama's tenure, but fell short of reality with the passage of the 'Affordable Care Act' (ACA) which skirted by universal health care leaving some disappointed. Had the ACA passed with universal health care coverage, it is likely that either state or societal stakeholders would have usurped private interests in one or more of system regulation, financing, or provision given the social and centralized infrastructure needed to enable universal coverage.

While not the focus of this case analysis, the political influence on health care system structure – and social capital -- is a significant confounding variable. It is beyond the scope of this analysis to consider the association between political traditions, social capital, and health care system structure. Nonetheless, this topic is worthy of further study and acknowledgement.

## 5.1 OBJECTIVE

The objective of this case is to test the hypothesis that countries with higher social capital are more likely to have health care systems with socialized structures such as state provision, regulation, or financing.

## 5.2 APPROACH

Similar to the previous case, a quantitative approach is utilized. The same social indices from the ISD are used as independent variables seen in the first case. As described in the methods section, a previously published typology that classifies the major OECD countries' health systems in discrete types and sub-types based on the major actor in each of the systems' regulatory, financing, and provision substructures are used as the dependent variables. The most appropriate statistical analysis in this case is a multinomial regression.

Performing regression analysis on a dependent variable with more than one categorical variable levels (in this case, health system regulation as i) state, ii) societal, or iii) private) requires a multinomial regression model. When performing multinomial regression, a reference level within each categorical variable must be selected. The reference level selection is arbitrary, but the 'normative' reference group can be selected so the results can be interpreted from an intuitive standpoint. When there is no ideal normative reference group, the group with the largest amount of observations can be used. In this case, the normative classifier of 'state' financing, regulation, and provision is used as our hypothesis aims to determine if higher social capital is associated with socialized health care structures.

## 5.3 DATA DESCRIPTION

As described in the methods chapter and in the previous case, social capital indices from the ISD from 210 countries were included. In this section, I will provide the summary statistics for the social capital indices that accompany the OECD countries with health care system

structure classifiers. Of note, there were fewer social capital index values available due to the relatively fewer countries subjected to the systems' structure typology. As was the case with the discussion on function, the summary statistics below indicate that the sample size for each variable is different. In some instances, the variable cases are considerably lower than others. There is random variation in the time interval and breadth of population sampling by country in the OECD and ISD databases. To preserve the integrity of the analysis with varied sample sizes we performed pairwise-deletion when incomplete variable sets were present.

To remedy the smaller sample size available for this analysis, a multiple imputation technique was used to 'fill in' the years with missing social capital index data. The multiple imputation technique used is mathematically complex but is an established technique to handle missing values by generating predicted values through sampling from the mean of the variable in question. Within the 'R' statistical software, this is completed using the '*aergImpute*' command of the '*Hmisc'* R software add-on. There is controversy as to the use of multiple imputation as means to 'fill in' holes in datasets with incomplete entries. Multiple imputation was originally designed to fill in gaps in large, public databases. (Rubin 1996, p. 473) Moreover, one of the chief proponents of multiple imputation states that "multiple imputation does not pretend to create information through simulated values but simply to represent the observed information … to make it amenable to valid analysis." (Rubin 1996, p. 479) We acknowledge that the optimal method for remedying small sample sizes is to collect more data, In this analysis, collecting more data by re-surveying each country was impractical and not feasible. Furthermore, imputation is a valid and trusted statistical tool that ameliorates the problem of incomplete data. (Schafer 1999; Rubin 1996)

### 5.3.1 Social Capital Index Inclusions

The following table describes the summary statistics of the social capital index observations paired to the OECD countries with characterized health care system structures (**Table 5.1**). Again, note the relatively fewer observations of the social capital index variables relative to the social capital index observations in the first case.

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Civic Activism Index | 124 | 0.65 | 0.09 | 0.46 | 0.53 | 0.70 | 0.88 |
| Intergroup Cohesion Index | 86 | 0.66 | 0.08 | 0.43 | 0.61 | 0.72 | 0.79 |
| Clubs & Associations Index | 123 | 0.54 | 0.07 | 0.32 | 0.49 | 0.58 | 0.67 |
| Interpersonal Safety & Trust Index | 120 | 0.57 | 0.05 | 0.44 | 0.54 | 0.60 | 0.70 |
| Gender Equality Index | 129 | 0.80 | 0.07 | 0.71 | 0.76 | 0.81 | 1.02 |
| Inclusion Index | 104 | 0.59 | 0.10 | 0.44 | 0.53 | 0.62 | 0.90 |

**Table 5.1**. Summary statistics of the social capital indices included in the health care systems multinomial regression analysis**.** *St Dev: standard deviation.*

The following table represents the same social capital indices after multiple imputation was performed (**Table 5.2**). Note the increase in observations (i.e. 'N'). The integrity of the multinomial regression model is significantly reinforced with a larger sample size, therefore the imputed dataset was carried forward into the regression analysis.

| Statistic | N | Mean | St. Dev. | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Civic Activism Index | 515 | 0.64 | 0.09 | 0.46 | 0.59 | 0.68 | 0.88 |
| Intergroup Cohesion Index | 515 | 0.66 | 0.08 | 0.43 | 0.61 | 0.71 | 0.79 |
| Clubs & Associations Index | 515 | 0.54 | 0.07 | 0.32 | 0.49 | 0.58 | 0.70 |
| Interpersonal Safety & Trust Index | 515 | 0.57 | 0.05 | 0.44 | 0.54 | 0.59 | 0.70 |
| Gender Equality Index | 515 | 0.80 | 0.07 | 0.71 | 0.76 | 0.81 | 1.02 |
| Inclusion Index | 515 | 0.60 | 0.10 | 0.44 | 0.53 | 0.65 | 0.90 |

**Table 5.2**. Summary statistics of the social capital indices included in the health care systems multinomial regression analysis after the multiple imputation function was performed**.** *St Dev: standard deviation.*

### 5.3.2. Health Care System Structure Inclusions

The following table is a description of the OECD countries included in the regression analysis with their respective heath care system structure typology as determined by Böhm et al. (**Table 5.3**). It is important to note that the regression model is naïve to the 'Country' from where the data is supplied. Our dataset had multiple years of social capital survey response data for each country. Thus, we do not regress on an n = 1 for private regulation and financing.

| Country | Health Care System Type | Regulation | Financing | Provision |
|---|---|---|---|---|
| Australia | National Health Insurance | State | State | Private |
| Austria | Social Health Insurance | Societal | Societal | Private |
| Belgium | Etatist Social Health Insurance | State | Societal | Private |
| Canada | National Health Insurance | State | State | Private |
| Denmark | National Health Service | State | State | State |
| Finland | National Health Service | State | State | State |
| France | Etatist Social Health Insurance | State | Societal | Private |
| Germany | Social Health Insurance | Societal | Societal | Private |
| Hungary | Etatist Social Health Insurance | State | Societal | Private |
| Iceland | National Health Service | State | State | State |
| Ireland | National Health Insurance | State | State | Private |
| Israel | Etatist Social Health Insurance | State | Societal | Private |
| Italy | National Health Insurance | State | State | Private |
| Korea | Etatist Social Health Insurance | State | Societal | Private |
| Luxembourg | Social Health Insurance | Societal | Societal | Private |
| Netherlands | Etatist Social Health Insurance | State | Societal | Private |
| Netherlands Antilles | Etatist Social Health Insurance | State | Societal | Private |
| New Zealand | National Health Insurance | State | State | Private |
| Norway | National Health Service | State | State | State |
| Poland | Etatist Social Health Insurance | State | Societal | Private |
| Portugal | National Health Service | State | State | State |
| Slovenia | Social-based Mixed Type | Societal | Societal | State |
| Spain | National Health Service | State | State | State |
| Sweden | National Health Service | State | State | State |
| Switzerland | Social Health Insurance | Societal | Societal | Private |
| United Kingdom | National Health Service | State | State | State |
| United States of America | Private | Private | Private | Private |

**Table 5.3**. Summary of the countries and health care systems' respective substructures included in the health care systems multinomial regression analysis**.** Adapted from Böhm et al, 2013.

## 5.4 RESULTS

This section presents the results from the multinomial regression models the health care structure analyses. A regression model was generated for each of the dependent variables of health care system type, regulation, financing, and provision. For each regression result, a table with the regression coefficient is provided along with a table with the exponent of the coefficient (such as the relative risk ratio).

The strength of a multinomial regression model is often reported using the Akaike information criterion (AIC). The AIC is not analogous to the $r^2$ used in generalized linear regression, but is a relative measure of the strength of the model fitting to other regression model outputs.

### 5.4.1. Health System Structure Regression: Health Care System Type

The following multinomial regression result presents the model associating overall health care system types as the dependent variable, and social capital indices as the independent variables (**Table 5.4**). The reference level of health care system type was selected to be '*National Health Service'* as that is the health system classification with pure state (meaning government) regulated, financed, and provided health care.

| | *Dependent variable:* | | | | |
|---|---|---|---|---|---|
| | Etatist Social Health Insurance | National Health Insurance | Private | Social-based Mixed Type | Social Health Insurance |
| | (1) | (2) | (3) | (4) | (5) |
| Civic Activism Index | -0.118 | -0.716 | 3.200 | **-8.528*** | -0.896 |
| | (2.009) | (2.194) | (2.932) | (5.127) | (2.334) |
| Intergroup Cohesion Index | 0.514 | 1.669 | -1.468 | -3.298 | 2.391 |
| | (2.073) | (2.394) | (3.150) | (3.850) | (2.620) |
| Clubs & Associations Index | **-4.100**** | 1.195 | 1.458 | -0.456 | -0.284 |
| | (2.037) | (2.202) | (2.952) | (4.232) | (2.380) |
| Interpersonal Safety &Trust Index | -2.211 | 0.091 | **-7.217*** | 1.303 | -0.114 |
| | (2.687) | (2.930) | (4.330) | (5.268) | (3.179) |
| Gender Equality Index | -2.834 | -0.598 | -1.056 | 1.030 | -1.133 |
| | (2.320) | (2.443) | (3.650) | (4.632) | (2.645) |
| Inclusion Index | **-2.968*** | 0.215 | -4.642 | 3.190 | 0.759 |
| | (1.757) | (1.861) | (2.846) | (3.594) | (1.960) |
| Constant | 7.095*** | -1.471 | 4.336 | 2.180 | -1.039 |
| | (2.313) | (2.471) | (3.762) | (4.446) | (2.645) |
| Akaike Inf. Crit. | 1,696.858 | 1,696.858 | 1,696.858 | 1,696.858 | 1,696.858 |
| *Note:* | *p < 0.1; **p < 0.05; ***p < 0.01 | | | | |

**Table 5.4**. Multinomial regression models for national health care system overall type and social capital indices**.** Coefficients with significant p-values **bolded** for emphasis. *Bracketed values represent standard error of the regression coefficient, p: p-value.*

The following table takes the exponent of the coefficients above to generate an intuitive relative risk ratio presentation of the same data (**Table 5.5**).

| | *Dependent variable:* | | | | |
|---|---|---|---|---|---|
| | Etatist Social Health Insurance | National Health Insurance | Private | Social-based Mixed Type | Social Health Insurance |
| | (1) | (2) | (3) | (4) | (5) |
| Civic Activism Index | 0.889 | 0.489 | 24.520 | **0.0002*** | 0.408 |
| | (2.009) | (2.194) | (2.932) | (5.127) | (2.334) |
| Intergroup Cohesion Index | 1.672 | 5.307 | 0.230 | 0.037 | 10.926 |
| | (2.073) | (2.394) | (3.150) | (3.850) | (2.620) |
| Clubs & Associations Index | **0.017**** | 3.304 | 4.299 | 0.634 | 0.753 |
| | (2.037) | (2.202) | (2.952) | (4.232) | (2.380) |
| Interpersonal Safety & Trust Index | 0.110 | 1.095 | **0.001*** | 3.680 | 0.892 |
| | (2.687) | (2.930) | (4.330) | (5.268) | (3.179) |
| Gender Equality Index | 0.059 | 0.550 | 0.348 | 2.800 | 0.322 |
| | (2.320) | (2.443) | (3.650) | (4.632) | (2.645) |
| Inclusion Index | **0.051*** | 1.240 | 0.010 | 24.284 | 2.136 |
| | (1.757) | (1.861) | (2.846) | (3.594) | (1.960) |
| Constant | 1,205.624*** | 0.230 | 76.386 | 8.842 | 0.354 |
| | (2.313) | (2.471) | (3.762) | (4.446) | (2.645) |
| Akaike Inf. Crit. | 1,696.858 | 1,696.858 | 1,696.858 | 1,696.858 | 1,696.858 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 | | | | |

**Table 5.5**. Relative risk ratios for the multinomial regression models for national health care system overall type and social capital indices**.** Relative risk ratios with significant p-values **bolded** for emphasis. *Bracketed values represent standard error, p: p-value.*

### 5.4.2. Health System Structure Regression: Regulation

The following multinomial regression result presents the model associating overall health care system regulation sub-types as the dependent variable, and social capital indices as the independent variables (**Table 5.6**). The reference level of health care system type was selected to be '*State'* regulation type.

| | *Dependent variable:* | |
|---|---|---|
| | Private | Societal |
| | (1) | (2) |
| Civic Activism Index | 3.469 | -1.865 |
| | (2.728) | (1.966) |
| Intergroup Cohesion Index | -2.053 | 0.381 |
| | (2.937) | (2.065) |
| Clubs & Associations Index | 2.656 | 0.643 |
| | (2.729) | (1.934) |
| Interpersonal Safety & Trust Index | -6.363 | 0.756 |
| | (4.085) | (2.569) |
| Gender Equality Index | 0.028 | 0.498 |
| | (3.447) | (2.161) |
| Inclusion Index | -3.782 | 2.132 |
| | (2.688) | (1.608) |
| Constant | 1.102 | -2.915 |
| | (3.521) | (2.110) |
| Akaike Inf. Crit. | 759.205 | 759.205 |
| *Note:* | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 | |

**Table 5.6**. Multinomial regression models for national health care system regulation sub-type and social capital indices. *Bracketed values represent standard error of the regression coefficient, p: p-value.*

The following table takes the exponent of the coefficients above to generate an intuitive relative risk ratio presentation of the same data (**Table 5.7**).

| | *Dependent variable:* | |
|---|---|---|
| | Private | Societal |
| | (1) | (2) |
| Civic Activism Index | 32.116 | 0.155 |
| | (2.728) | (1.966) |
| Intergroup Cohesion Index | 0.128 | 1.463 |
| | (2.937) | (2.065) |
| Clubs & Associations Index | 14.244 | 1.901 |
| | (2.729) | (1.934) |
| Interpersonal Safety & Trust Index | 0.002 | 2.130 |
| | (4.085) | (2.569) |
| Gender Equality Index | 1.028 | 1.646 |
| | (3.447) | (2.161) |
| Inclusion Index | 0.023 | 8.432 |
| | (2.688) | (1.608) |
| Constant | 3.010 | 0.054 |
| | (3.521) | (2.110) |
| Akaike Inf. Crit. | 759.205 | 759.205 |
| *Note:* | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 | |

**Table 5.7**. Relative risk ratios for the multinomial regression models for national health care system overall type and social capital indices**.** *Bracketed values represent standard error, p: p-value.*

### 5.4.3. Health System Structure Regression: Financing

The following multinomial regression result presents the model associating overall health care system financing sub-types as the dependent variable, and social capital indices as the independent variables (**Table 5.8**). The reference level of health care system type was selected to be '*State'* financing type.

| | *Dependent variable:* | |
|---|---|---|
| | Private | Societal |
| | (1) | (2) |
| Civic Activism Index | 3.431 | -0.729 |
| | (2.802) | (1.554) |
| Intergroup Cohesion Index | -2.083 | 0.110 |
| | (3.022) | (1.635) |
| Clubs & Associations Index | 1.079 | **-2.968*** |
| | (2.815) | (1.562) |
| Interpersonal Safety & Trust Index | **-7.210*** | -1.339 |
| | (4.182) | (2.072) |
| Gender Equality Index | -0.803 | -1.593 |
| | (3.520) | (1.760) |
| Inclusion Index | **-4.665*** | -1.119 |
| | (2.740) | (1.322) |
| Constant | 4.122 | 4.633*** |
| | (3.619) | (1.748) |
| Akaike Inf. Crit. | 936.018 | 936.018 |
| *Note:* | | *p<0.1; **p<0.05; ***p<0.01 |

**Table 5.8**. Multinomial regression models for national health care system financing sub-type and social capital indices**. Coefficients with** significant p-values **bolded** for emphasis. *Bracketed values represent standard error of the regression coefficient, p: p-value.*

The following table takes the exponent of the coefficients above to generate an intuitive relative risk ratio presentation of the same data (**Table 5.9**).

| | *Dependent variable:* | |
|---|---|---|
| | Private | Societal |
| | (1) | (2) |
| Civic Activism Index | 30.899 | 0.483 |
| | (2.802) | (1.554) |
| Intergroup Cohesion Index | 0.125 | 1.116 |
| | (3.022) | (1.635) |
| Clubs & Associations Index | 2.943 | **0.051*** |
| | (2.815) | (1.562) |
| Interpersonal Safety & Trust Index | **0.001*** | 0.262 |
| | (4.182) | (2.072) |
| Gender Equality Index | 0.448 | 0.203 |
| | (3.520) | (1.760) |
| Inclusion Index | **0.009*** | 0.327 |
| | (2.740) | (1.322) |
| Constant | 61.710 | 102.791*** |
| | (3.619) | (1.748) |
| Akaike Inf. Crit. | 936.018 | 936.018 |
| *Note:* | | *p<0.1; **p<0.05; ***p<0.01 |

**Table 5.9**. Relative risk ratios for the multinomial regression models for national health care system financing sub-type and social capital indices**. Relative risk ratios and** significant p-values bolded for emphasis. *Bracketed values represent standard error, p: p-value.*

### 5.4.4. Health System Structure Regression: Provision

The following multinomial regression result presents the model associating overall health care system provision sub-types as the dependent variable, and social capital indices as the independent variables (**Table 5.10**). The reference level of health care system type was selected to be '*State'* provision type. Therefore, the remaining provision type is '*Private.'*

| | *Dependent variable:* |
|---|---|
| | Private |
| Civic Activism Index | 0.517 |
| | (1.569) |
| Intergroup Cohesion Index | 1.377 |
| | (1.641) |
| Clubs & Associations Index | -0.881 |
| | (1.563) |
| Interpersonal Safety & Trust Index | -1.710 |
| | (2.084) |
| Gender Equality Index | -1.645 |
| | (1.774) |
| Inclusion Index | -1.534 |
| | (1.334) |
| Constant | 3.146* |
| | (1.748) |
| Akaike Inf. Crit. | 665.533 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

**Table 5.10**. Multinomial regression models for national health care system provision sub-type and social capital indices**.** Significant p-values **bolded** for emphasis. *Bracketed values represent standard error of the regression coefficient, p: p-value.*

The following table takes the exponent of the coefficients above to generate an intuitive relative risk ratio presentation of the same data (**Table 5.11**).

| | *Dependent variable:* |
|---|---|
| | Private |
| Civic Activism Index | 1.677 |
| | (1.569) |
| Intergroup Cohesion Index | 3.965 |
| | (1.641) |
| Clubs & Associations Index | 0.414 |
| | (1.563) |
| Interpersonal Safety & Trust Index | 0.181 |
| | (2.084) |
| Gender Equality Index | 0.193 |
| | (1.774) |
| Inclusion Index | 0.216 |
| | (1.334) |
| Constant | 23.232* |
| | (1.748) |
| Akaike Inf. Crit. | 665.53 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

**Table 5.11**. Relative risk ratios for the multinomial regression models for national health care system provision sub-type and social capital indices**.** Significant p-values **bolded** for emphasis. *Bracketed values represent standard error, p: p-value.*

## 5.5 DISCUSSION

In contrast to the aim of the first case in exploring health care system function, this analysis explored the association between health care system structure and relative levels of social capital indices. In further contrast to the first case, the results of the regression analyses were less demonstrative of an association. The hypothesis tested in this case was that higher levels of social capital translates into more 'socialized' health care system structures with a stronger or more central role of government or society in either the regulation, financing, or provision of care. When looking at overall health care system classification, higher levels of four social capital indices were more likely to predict a socialized '*National Health Service'* (all state-driven system sub-structures) compared to other system types. When analyzing system regulation, financing, and provision individually, only system financing observed a similar association between higher social capital with a more socialized health system architecture.

The regression models were designed such that the reference level for comparison was the '*National Health Service'* overall system type when investigating the national system types, and '*State'* driven sub-types. The rationale for this choice was because the hypothesis argues for a larger role of state health system structures in nations with higher social capital. Indeed, higher levels the bridging social capital indices of *'Civic Activism,*' and *'Inclusion'* predicted more state-driven systems when compared against systems with either *'Etatist Social Health Insurance'* systems, or *'Social-based Mixed Type*' systems. Recall from **Table 5.3**, that *'Etatist Social Health Insurance'* and *'Social-based Mixed Type'* systems have regulation-financing-provision substructures of state-societal-private and societal-societal-state, respectively. Similarly, the bonding social capital indices of *'Clubs & Associations*' and *'Interpersonal Safety & Trust'* predicted a higher likelihood of *'National Health Service'* system types compared to *'Etatist Social Health Insurance*' and *'Private'* system types. '*Etatist Social Health Insurance*' and *'Private'* overall system types are similar in that the care provision is dominated by private

entities. From one perspective, these results support the hypothesis that higher levels of social capital - of either bonding or bridging types - predict higher state involvement in health care system structure. The link between lower bonding social capital and systems with private provision hint at an extension to the conclusions rendered in Williams' paper. Recall that Williams' regression models predicted higher health care resource utilization in regions with low social capital within the United States of America - a private health care system. While Williams did not explicitly test bonding or bridging social capital as predictors of health care utilization within the United States' private system, it is plausible that he might have found lower levels of bridging social capital. After all, we found a higher role for 'state' in health care system structure with higher bridging social capital.

The only sub-system component to produce an association between social capital and sub-system type occurred with system financing. In this regression model, higher levels of the bonding social capital indices of 'Clubs & Associations,' and 'Interpersonal Safety & Trust' portended a higher likelihood of state financing versus private financing. In addition, a higher 'Clubs & Associations' index predicted a higher likelihood of state financing over societal. This result is congruent with the assertion that higher social capital leads to more state-central health care system structures. From a political and sociologic perspective, a society with higher social capital might be more trusting and inclusive of different groups, ideas, and have an open mind to social welfare. This might translate into trust or support for a central role of government in the financing of health care. However, the regression model does not provide clarity on the granularity of bonding versus bridging social capital as producing distinct effects on health care system structure.

There are several assumptions at play in this analysis that require scrutiny. Principally, it is plausible that higher social capital does not portend an increased chance for state-driven care structures. This analysis is ill-equipped to explore the mechanism driving the association

between social capital and health care system structure presence or formation. It is equally plausible that a health care system structure influences social capital, as much as social capital influences the development of a specific health care system structure. Recall that Tocqueville contended that social structure and development - and thus social capital to an extent - are engrained in the foundation of a nation state and persist through time. A Tocquevillian perspective on the chicken-or-the-egg argument of social capital and heath care system structure might argue that a nation's social fabric and penchant for social capital sets the foundation for which socialized services take form. Further analysis of this question enters the realm of evolutionary sociology and is an interesting avenue for further research and testing.

The results of the regression models - and therefore the derived conclusions - would be more convincing if a more consistent pattern emerged. Given the coarse composition of the social capital indices and the assorted survey questions and prompts aggregated within each, it is difficult to generate an intuitive explanation as to why some of the social capital indices supported the hypothesis whereas others did not. It is also difficult to explain why the regression models for provision and regulation failed to produce any significant relationship between social capital and subcomponent structure. It is conceivable that the same reasons why a nation might be more likely to have state-centric financing, might also have the state driving provision and regulation.

The regression models lay some support to the hypothesis that increased social capital index levels produce a higher likelihood of socialized, state-centric health care system structures. The nuanced relationship of bonding versus bridging capital is not well characterized in the results of this analysis, which may represent a limitation of the health care system structure typology, the relevance of each social capital index to the central question, or both. Moreover, the directionality of the relationship is in question. Does the founding social fabric of a nation dictate the structure of social welfare programs such as health care? Or, does the

structure of health care sculpt and shape social capital in the populace? These questions area important for further study and analysis. Nonetheless, this is the first analysis to produce quantitative evidence to suggest an association between social capital.

# 6 IMPLICATIONS FOR HEALTH POLICY & FUTURE DIRECTIONS

This analysis explores and subsequently demonstrates an association between national health care system structure and function proxies and social capital indices. The most intriguing finding of this analysis was that higher national scores on bridging social capital indices were predictive of higher health care spending. The mechanism for this remains unexplored, but countries with high bridging social capital could harbor progressive health care polices. Similarly, bridging capital was associated with higher utilization of public health and essential service health system functions, and bonding capital with less utilization in the case of public health immunizations. The regression models of the structure analysis supported the hypothesis that increased social capital index levels produce a higher likelihood of socialized, state-centric health care system structures. Further characterization of the relationship of bonding versus bridging capital and health care system structure was limited. In this chapter, I will explore the potential significance of these findings as well important domains for future study and analysis.

## 6.1 SOCIAL CAPITAL AS A HEALTH POLICY TOOL

Engineering health systems to foster social capital is one example of a determinant-focused approach to improving health outcomes. (Deber 2018) Health policymakers might target any determinant of health (e.g. healthy behaviors, education, literacy), and social capital is no different. The 'holy grail' of social capital research in public policy is to unearth ways in which social capital may be engineered to generate an intended policy outcome. An alternative and equally satisfying goal may be to generate policies to bolster social capital in a populace. The present analysis fails to achieve either aim but adds insights to the contemporary literature on the relationship between social capital and health care system and function. The tantalizing

yet elusive goal of policymakers in generating social capital is limited by a relative ambiguity on what form of social capital to promote, and the specific mechanisms for doing so. Nonetheless, much of the literature on social capital generation has identified 'bottom-up' (meaning generation of social capital from grass-roots societal means), or 'top-down' (meaning generation of social capital through political institutions or levers) approaches. (Castiglione et al. 2008, p. 275) In this section, I will briefly review opportunities for how top-down or bottom-up social capital generation may shape public health policy.

Using the social capital posterchild concept of 'trust', Rothstein and Stolle believe that "persuading amisanthropic and cynical group of individuals who deeply mistrust their fellow human beings to change their minds would probably not be counted among the easier projects in life." (Castiglione et al. 2008, p. 274) This public trust -- or mistrust -- likely was not cemented overnight. Thus, considerable effort may be required on the part of policymakers to reverse the tide of mistrust to promote the genesis of social capital. Indeed, Rothstein and Stolle attribute the historical relevance of the society-centered approach to social capital generation as stemming from "long traditions of civic engagement and group life that in turn produce desirable outcomes such as norms of reciprocity and generalized trust." (Castiglione et al. 2008, p. 275) I do not believe Rothstein and Stolle meant to imply that social capital generation is futile in societies lacking a historical commitment to civic engagement. Rather, social capital generation from a 'bottom-up' approach is plausible in a primed society. The type of trust also matters. If intra-group trust is emphasized, then stakeholder groups may achieve higher bonding capital with a net loss of global social capital in the sacrifice of bridging capital. The classic argument is that of gangs and societal miscreants as "involvement in an organization that produces only in-group trust or actual distrust of out-groups must then be noted as a minus item on the social capital balance sheet." (Castiglione et al. 2008, p. 276) Thus, a political institution might be

weary of supporting grass-roots capital generating programs that serve to erect walls and barriers between groups, rather than building bridges between them.

An interesting domain for further research in the application of grass-roots social capital generation and health policy is the advent of crowd-funding to support medical-related expenses. Crowd-funding for public assistance in the procurement of resources (meaning monetary) is a relatively new phenomenon facilitated by internet-based social media channels. Crowd-funding campaigns are often advertised using known contacts over social media portals (such as Facebook, Twitter) and use dedicated platforms such as 'GoFundMe' (www.gofundme.com). Through these connections, previously unconnected members of the public may be drawn to the campaign in the form of contributing. Certain campaigns may - especially in the case of a particularly grievous or empathetic cause - realize national or international audiences. In this application, social capital is utilized by the primary stakeholder through the canvassing of existing social networks for donations. Social capital may also be generated through forging new connections between previously unknown donors and the primary stakeholder. Through the study of this novel mechanism we might be able to elucidate the impact of medical care crowdfunding on the aggregate social capital of regional communities and national societies.

The implication of the study of the bottom-up and top-down social capital production mechanisms is that a tailored approach to capital generation is necessary. The target populace or society would need to be studied in detail to determine if a bottom-up approach is appropriate. As Rothstein and Stolle implied, societies rife with mistrust may not respond well to a bottom-up approach. A top-down approach might then be the best alternative. I have previously outlined how social capital has been associated with outcomes in cardiovascular disease, diabetes, and infectious disease epidemiology. (Kawachi et al. 2008, p. 164, 2008, p. 164, 2008, p. 175, 2008, p. 172). There is limited evidence published to date that has

explored social capital as a public policy tool. In fact, some argue that it is premature to operationalize social capital as a health policy tool. (Shortt 2004, p. 17) Despite the lack of evidence for its utility, interest groups have attempted to use bottom-up social capital to enhance public health policy. One of the more prominent case studies involves the Middle East and North Africa (MENA) Initiative's use of bridging, bonding, and linking social capital to support patients afflicted with the human immunodeficiency virus (HIV).The use of each social capital metric is outlined below (**Table 6.1**; adapted from (Ogden et al. 2014, p. 1079)). This approach is grounded in the method of first bringing individuals together (bonding), create networks of groups (bridging), and elevate the groups to seek associations with "powerful groups of policy-makers." (Ogden et al. 2014, p. 1080)

| Social Capital Subtype | Application |
|---|---|
| Bonding | "Focused trainings and workshops led by and for PLHIV in the region, which were for some individuals the first time they had met and talked with others in their situation." (Ogden et al. 2014) |
| Bridging | "Individual bonded groups came together in a regional network led by and for PLHIV, known as MENA, and strengthening in-country partnerships among PLHIV, national AIDS programs (NAPs) and non-governmental organizations (NGOs)." (Ogden et al. 2014) |
| Linking | "Exemplified initially by increased country ownership of NAPS around the region who pledged support and funding for participant costs and country-level activities.<br><br>Further linking came through successful efforts to engage key donors and international NGOs. Successes here included a commitment from the Ford Foundation and the International Community of Women Living with HIV (ICW) to support the formation of a regional network for HIV-positive women in MENA, and additional support acquired from partners including UNDP's HIV/AIDS Regional Programs in the Arab States, Catholic Relief Services (CRS), ICW, Ford Foundation, NAPs and local NGOs.<br><br>In addition, this process increased participation of people living with HIV from the MENA region in national, regional and global HIV forums and in key decision-making positions including Global Fund Country Coordinating Mechanisms." (Ogden et al. 2014) |

**Table 6.1**. The MENA Initiative's use of social capital in support of a public health campaign targeting human immunodeficiency virus (HIV).

Of course, marshalling individuals and engaging communities in health policy promotion is not an innovative approach. The innovative component is an enhanced focus on social capital as the key mechanism in generating the desired outcome in the health policy process. Again, the "key challenge in applying the proposed model … lies in the lack of clear mechanisms to facilitate or systematize linking social capital." (Ogden et al. 2014, p. 1082) This analysis demonstrates an association between health care system structure and function and bottom-up social capital – perhaps health system planners should consider the context of social capital when considering health care system reform. Using the MENA Initiative as a template, health policy makers might make specific accommodations and lower barriers of entries for bottom-up stakeholder organizations that facilitate bridging and linking social capital activities.

## 6.2 FUTURE RESEARCH DIRECTIONS

One of the chief criticisms of social capital is that the concept is too vague and too subjective for it to be reproducibly mobilized in applied analyses. Many social capital analysts and investigators have decried the need for standardization and consensus for the definition of social capital and its application. (Cozzolino 2011, p. 303; Breede 2017, p. 68; Shortt 2004, p. 13; Hyyppä 2010, ix; Averett et al. 2014, p. 181; Breede 2017, p. 101) The heterogeneous results in this analysis are demonstrative of this need. The indices used in this analysis are proxy measures for social capital comprised of numerous survey questions. If firm definitions of bridging and bonding social capital existed, then perhaps only a few internally and externally valid questions would be needed for each social capital type. Furthermore, limiting the heterogeneity in the proxy measures might also decrease the size of error and variability in the quantitative analyses. Lastly, some social capital scholars believe that bonding social capital harbors a negative reception from the perspective in that bonding social capital enables an 'us

versus them' mentality in public behavior and discourse. (van Deth and Zmerli 2009, p. 632; Breede 2017, p. 74, 2017, p. 71) In this instance, such 'negative externalities' of bonding social capital are real and may play a counterbalancing role to the more desirable positive social capital forms (such as bridging capital). (van Deth and Zmerli 2009, p. 632)

An additional line of questioning might further describe the relationship between social capital and specific health policy performance. An interesting topic within this realm is a possible role of social capital and the effectiveness of vaccination campaigns in Canada. Public immunization programs are vital to public health as they generate 'herd immunity' that prevents the spread of communicable disease through a community. Herd immunity is achieved when a sufficient proportion of the population is immune to a pathogen that has the potential to effectively spread in absence of vaccinated community members. Vaccine campaigns are rather socialized in terms of the public's trust in the ability of the vaccine to prevent disease (and not cause significant harm), and trust in the government to provide the vaccination. Mistrust in immunization campaigns has produced a contemporary "anti-vaccine" movement where a small proportion of the population believes vaccines either are ineffective or cause harm (e.g. autism in children). Might the "anti-vaccine" movement be another example of a negative externality of bonding capital?

The viral 'anti-vaccination' campaign was propelled the forefront of international discourse nearly a decade ago after Andrew Wakefield of the United Kingdom published a now discredited report on data linking childhood vaccination to autism spectrum disorders. (Nichols 2017, p. 181) Recall that one component of health care access is the acquisition of sharing of medical knowledge. This has a direct application to social capital as social networks within communities is one vital mechanism for health information dissemination. The anti-vaccination phenomenon points to an interesting development in the relationship between health information dissemination and social capital.

Our social networks are now international and gigantic in scale thanks to the widespread availability of web-connected devices and social media technologies. This instantaneous connectivity has linked previously isolated individuals and groups. A social network is not only who lives next door, but inclusive of all connections in social media portals. A benefit - and detriment - of this enhanced social connectivity is the ease in which information is distributed. (Nichols 2017, p. 111) There is no peer review or filter for this information highway. (Nichols 2017, p. 110) There is no requirement for accuracy or credibility.

In his book "*The Death of Expertise*," Thomas Nichols argued that many societies now have an acute hostility against expert knowledge and counsel. (Nichols 2017, p. 20) As a result, confirmation bias and intellectual narcissism inhibit thoughtful debate, critical inquiry, and the scientific method for exploring the unknown. He specifically addresses the case of Wakefield in revealing that parents with enough education to be confident enough to "challenge established medical science" were more likely to resist vaccination than "small-town mothers with limited schooling." (Nichols 2017, p. 21) While Nichols doesn't explicitly tie in social capital to his thesis, important parallels are present. Is health misinformation dissemination higher in communities with higher concomitant bonding capital? Perhaps health information dissemination through social networks is a key factor in the success of public health programs.

An interesting analysis would be to quantitatively explore if strong regional bonding social capital affects regional vaccination rates. As of the publication of this manuscript, one U.S.-based study attempted to draw a connection between health communication behaviors of parents and rates of vaccination against the H1N1 virus in their children. (Jung et al. 2013) Specifically, the authors quantitatively assessed whether health communications and neighborhood social capital were predictive of H1N1 vaccination rates. They found that both information exposure and access to information were predictive of H1N1 vaccination rates along with neighborhood social capital. Neighborhood social capital was determined through survey

questions pertaining to trust in neighbors, willingness to help neighbors, and neighborhood cohesion. (Jung et al. 2013, p. 4862) A limitation on the extension of this study's conclusions on the role of social capital and the vaccination movement is the lack of granularity on the type of social capital. The study's social capital survey questions are not necessarily either wholly bridging or bonding capital. Nonetheless, this study is an interesting exploration on the association between social capital and vaccination behaviors. Further exploration of such an association may prove to generate further motivation for policymakers to target social capital as a means for boosting herd immunity through vaccination.

One of the main limitations in proceeding with regional analyses is that lack of granularity in the available social capital survey data. As discussed earlier in this manuscript, there is considerable inherent regional variability in health care utilization and spending relating to complex circumstances surrounding regional health needs, access to services, socioeconomic factors, and ethnic/cultural contexts. Regional sampling is prudent to account for within-country or within-province/state variability. Moreover, random sampling within different communities in a study region is needed to limit the influence of confounders on the data. Obtaining survey data that accurately portrays regional contexts is no easy task as the process requires consistent design, participant procurement, and response collection. Unless we are provided the necessary resources to conduct robust survey experiments, omnibus trans-national databases – such as the ISD – remain our only readily available resource. Thus, assumptions must be acknowledged, and conclusions tempered to the weaknesses supplied by the prospect of regional variability.

A 'chicken-or-the-egg' dilemma exists as the core conflict in understanding a mechanism connecting social capital and health care system structure and function – does intrinsic social capital produce a given health system type? Or, do health care system types generate – or impede – social capital development? To further explore the association between health care

system structure and social capital, a historical survey is needed. Tocqueville theorists might argue that the founding values and social institutions are engrained and set early in the genesis of a country. In this case, an empirical characterization system would be prudent to systematically analyze the founding social institutions. Second and last, an in-depth analysis of the influence of political institutions as a potential contributing or confounding variable is prudent. In the second case I briefly introduced the likely role for political influence in health care system structure and function. Given the available data and analytic plan, I was unable to integrate political influence. Nonetheless, political influence is indivisible from a national health care system and warrants further examination.

## 6.3 CONCLUSIONS

This is the first analysis to analyze social capital indices and their association with national health care system structure and function. Higher levels of bridging social capital were associated with higher health care spending, and higher level of bridging capital was associated with higher utilization of public health and essential service health system functions. Moreover, the system structure analysis supported the hypothesis that increased social capital index levels produce a higher likelihood of socialized, state-centric health care system structures. This analysis is an important first step in exploring how social capital sculpts public health infrastructure, however the direction of association remains unexplored. The strength and robustness of this analysis is limited to the variability inherent to the working definition of social capital, as well as uncertainty in the direction of association. Social capital as a tool for health policy development may not be the panacea for improving population health but may prove to be a vital instrument in maximizing the effectiveness of public health interventions.

As surgeon, I have observed firsthand the intangible effects of social capital for the ‘haves’ and ‘have-nots’. The myriad resources needed by patients to keep on top of important appointments and life-sustaining treatments are difficult to navigate for those without strong, healthy social networks. We must not ignore the role of social capital in health care system function. Important future research efforts might further hone in on the nuances of bridging and bonding capital in health systems as well as the effect of social capital on specific health policy and intervention performance. These research efforts should be supported by governments, funding agencies, and population-health stakeholders to develop and maximize the utility of social capital-oriented approaches to health care system challenges.

## **7.0 APPENDIX** – CORRELATION TABLES FOR UTILIZATION ANALYSIS

| | *Appendectomy* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *Appendectomy Total procedures per 100,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.089<br>*(.508)* | | | | | | |
| *Intergroup Cohesion* | 0.107<br>*(.424)* | 0.127<br>*(.344)* | | | | | |
| *Clubs & Associations* | -0.113<br>*(.400)* | 0.526<br>*(<.001)* | 0.120<br>*(.372)* | | | | |
| *Interpersonal Safety & Trust* | 0.115<br>*(.391)* | 0.622<br>*(<.001)* | 0.287<br>*(.029)* | 0.439<br>*(.001)* | | | |
| *Gender Equality* | -0.045<br>*(.738)* | 0.129<br>*(.335)* | 0.727<br>*(<.001)* | 0.080<br>*(.552)* | 0.266<br>*(.044)* | | |
| *Inclusion* | -0.009<br>*(.948)* | 0.559<br>*(<.001)* | 0.487<br>*(<.001)* | 0.291<br>*(.027)* | 0.510<br>*(<.001)* | 0.359<br>*(.006)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 1**. Correlation matrix of 'appendectomy' procedures per 100,000 inhabitants' and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *CABG Procedures* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *CABG procedures per 100,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.475<br>*(<.001)* | | | | | | |
| *Intergroup Cohesion* | 0.074<br>*(.587)* | 0.116<br>*(.391)* | | | | | |
| *Clubs & Associations* | 0.129<br>*(.340)* | 0.501<br>*(<.001)* | 0.119<br>*(.378)* | | | | |
| *Interpersonal Safety & Trust* | 0.418<br>*(.001)* | 0.588<br>*(<.001)* | 0.299<br>*(.024)* | 0.385<br>*(.003)* | | | |
| *Gender Equality* | -0.057<br>*(.674)* | 0.122<br>*(.366)* | 0.718<br>*(<.001)* | 0.079<br>*(.559)* | 0.285<br>*(.032)* | | |
| *Inclusion* | 0.204<br>*(.128)* | 0.560<br>*(<.001)* | 0.466<br>*(<.001)* | 0.260<br>*(.051)* | 0.525<br>*(<.001)* | 0.348<br>*(.008)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 2**. Correlation matrix of '*CABG (coronary artery bypass graft*)' procedures per 100,000 inhabitants' and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *Hip Replacements* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *Hip replacements Total procedures per 100,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.618 *(<.001)* | | | | | | |
| *Intergroup Cohesion* | 0.441 *(.001)* | 0.078 *(.566)* | | | | | |
| *Clubs Associations* | 0.380 *(.004)* | 0.520 *(<.001)* | 0.038 *(.778)* | | | | |
| *Interpersonal Safety & Trust* | 0.561 *(<.001)* | 0.602 *(<.001)* | 0.263 *(.048)* | 0.396 *(.002)* | | | |
| *Gender Equality* | 0.201 *(.135)* | 0.110 *(.414)* | 0.718 *(<.001)* | 0.046 *(.732)* | 0.256 *(.055)* | | |
| *Inclusion* | 0.545 *(<.001)* | 0.539 *(<.001)* | 0.474 *(<.001)* | 0.251 *(.060)* | 0.493 *(<.001)* | 0.355 *(.007)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 3**. Correlation matrix of *'Hip replacements: total procedures per 100,000 inhabitants'* and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *TDaP Immunization* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *TDaP Immunization % of children immunized* | | | | | | | |
| *Civic Activism* | 0.160 *(.097)* | | | | | | |
| *Intergroup Cohesion* | 0.381 *(<.001)* | 0.315 *(.001)* | | | | | |
| *Clubs& Associations* | -0.192 *(.046)* | 0.399 *(<.001)* | 0.125 *(.197)* | | | | |
| *Interpersonal Safety & Trust* | -0.150 *(.122)* | 0.607 *(<.001)* | 0.213 *(.027)* | 0.278 *(.004)* | | | |
| *Gender Equality* | 0.331 *(<.001)* | 0.303 *(.001)* | 0.722 *(<.001)* | 0.078 *(.420)* | 0.130 *(.179)* | | |
| *Inclusion* | 0.246 *(.010)* | 0.695 *(<.001)* | 0.516 *(<.001)* | 0.191 *(.048)* | 0.549 *(<.001)* | 0.448 *(<.001)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 4**. Correlation matrix of '*Tetanus, Pertussis, and Diphtheria (TDaP) immunization'* metric and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *Computed Tomography Exams* | *Civic Activism* | *Intergroup Cohesion* | *Clubs Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *Computed Tomography exams, Total Per 1,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.333 *(.051)* | | | | | | |
| *Intergroup Cohesion* | 0.206 *(.236)* | 0.008 *(.963)* | | | | | |
| *Clubs & Associations* | 0.506 *(.002)* | 0.719 *(<.001)* | 0.129 *(.460)* | | | | |
| *Interpersonal Safety & Trust* | 0.071 *(.686)* | 0.540 *(.001)* | 0.315 *(.066)* | 0.521 *(.001)* | | | |
| *Gender Equality* | 0.224 *(.197)* | 0.135 *(.441)* | 0.720 *(<.001)* | 0.183 *(.293)* | 0.312 *(.068)* | | |
| *Inclusion* | 0.166 *(.339)* | 0.575 *(<.001)* | 0.412 *(.014)* | 0.517 *(.001)* | 0.569 *(<.001)* | 0.358 *(.035)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 5**. Correlation matrix of '*Computed Tomography exams, Total Per 1,000 inhabitants'* and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *Magnetic Resonance Imaging Exams* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *Magnetic Resonance Imaging exams, total per 1,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.492 *(.003)* | | | | | | |
| *Intergroup Cohesion* | 0.228 *(.188)* | 0.008 *(.963)* | | | | | |
| *Clubs & Associations* | 0.618 *(<.001)* | 0.719 *(<.001)* | 0.129 *(.460)* | | | | |
| *Interpersonal Safety & Trust* | 0.377 *(.025)* | 0.540 *(.001)* | 0.315 *(.066)* | 0.521 *(.001)* | | | |
| *Gender Equality* | 0.138 *(.430)* | 0.135 *(.441)* | 0.720 *(<.001)* | 0.183 *(.293)* | 0.312 *(.068)* | | |
| *Inclusion* | 0.320 *(.061)* | 0.575 *(<.001)* | 0.412 *(.014)* | 0.517 *(.001)* | 0.569 *(<.001)* | 0.358 *(.035)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 6**. Correlation matrix of '*Magnetic Resonance Imaging exams, total per 1,000 inhabitants'* and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

| | *Inpatient Care Discharges* | *Civic Activism* | *Intergroup Cohesion* | *Clubs & Associations* | *Interpersonal Safety & Trust* | *Gender Equality* | *Inclusion* |
|---|---|---|---|---|---|---|---|
| *Inpatient Care Discharges Per 100,000 inhabitants* | | | | | | | |
| *Civic Activism* | 0.180<br>*(.099)* | | | | | | |
| *Intergroup Cohesion* | 0.229<br>*(.035)* | 0.215<br>*(.048)* | | | | | |
| *Clubs Associations* | -0.108<br>*(.327)* | 0.551<br>*(<.001)* | 0.196<br>*(.072)* | | | | |
| *Interpersonal Safety & Trust* | 0.356<br>*(.001)* | 0.681<br>*(<.001)* | 0.201<br>*(.066)* | 0.347<br>*(.001)* | | | |
| *Gender Equality* | 0.215<br>*(.048)* | 0.120<br>*(.273)* | 0.693<br>*(<.001)* | 0.158<br>*(.150)* | 0.098<br>*(.373)* | | |
| *Inclusion* | 0.140<br>*(.203)* | 0.641<br>*(<.001)* | 0.529<br>*(<.001)* | 0.392<br>*(<.001)* | 0.611<br>*(<.001)* | 0.333<br>*(.002)* | |

*Computed correlation used Pearson-method with listwise-deletion.*

**Appendix Table 7**. Correlation matrix of '*Inpatient Care Discharges Per 100,000 inhabitants'* and social capital indices. P-values are inset with brackets below their respective correlation coefficients. Pairs with insignificant values ($p > 0.05$) are de-emphasized with a faint font tint.

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