Comparing Healthcare Systems of Luxembourg and the United States

Sarita Mantravadi
University of West Florida

Dallas Snider
University of West Florida

In this paper we compare the healthcare systems of Luxembourg and the United States from a health economics perspective which provides a better real-world illustration of economic factors that have the most substantial impact and influence along with their outcomes and economic consequences on these health systems. Details of the Luxembourgish systems will be described, and the two healthcare systems and their performance will be assessed.

OVERVIEW

The Grand Duchy of Luxembourg is a land-locked country in Europe, bordered by Germany, Brussels, and France, and belongs to the shared economy of the European Union. Luxembourg is a democratic monarchy with a population of approximately half a million people. The country has a strong economy, high gross domestic product (GDP) of $98,110 USD, and low health care spending (Government of the Grand Duchy of Luxembourg, 2017). Since Luxembourg is a wealthy nation, it appears that it spends a lower amount of GDP on health care than the European Union (EU), although in reality, the country's national health expenditures are the highest in the World Health Organization's EU region. As of 2012, Luxembourg's national health expenditures are €3,926.7/$USD 6,341 per capita which is 6.6% of its GDP (Berthet, et al., 2015). In contrast, the U.S. spends a whopping 17.8% of GDP on healthcare – $ 9,990 USD per capita (U.S. Centers for Medicare & Medicaid Services, 2016). The implications of the healthcare systems design of Luxembourg are significant, as this small country (998m^2 size) with low population density and rural areas, has high ratings for most quality and health status indicators, as well as low health expenditures. The country has a GINI index of 34.8 from 2006-2010, indicating modest income inequality. A GINI index of 0 represents perfect equality, while an index of 100 implies perfect inequality (The World Bank Group, n.d.).

Luxembourg's health system is distinctive on several dimensions, such as state level financing, comprehensive healthcare coverage, right to healthcare and long term care, free choice of providers (both physician & hospital), and health status compared to the market health system in the United States (U.S.). Comparing and contrasting the health system of these two countries from a health economics perspective will provide a better real world illustration of economic factors that have the most substantial impact/ influence and their outcomes/economic consequences on these health systems. Details of the

Luxembourgish systems will be described, and the two healthcare systems and their performance will be assessed.

Healthcare System Organization

The organization of the country's healthcare system is relatively centralized. Since Luxembourg is a small country, it becomes efficient to organize its healthcare system. Luxembourg recently passed legislation to reorganize their healthcare system from 2010 to 2015, and to address inefficiencies. The regulation of the healthcare system is synchronized between the Ministry of Health and Ministry of Social Security. The Ministry of Health is in charge of national level health planning, enacting and implementing health policy, hospital investments, and is involved in the financing of healthcare and public health (Berthet, et al., 2015); and further delegates implementation to the Directorate of Health. The Ministry of Health is headed by the minister of health, while the Directorate of Health is supported by 2 deputy directors (Digital Luxembourg, 2016). The Directorate of Health further subdivides itself into administrative departments, and medical/technical health departments. The medical/technical components of Directorate of Health include eleven business divisions, including the divisions of sanitary inspection, preventive medicine, school medicine and division of health of children and adolescents, curative medication and health quality, pharmacy and medicines, radiation protection, occupation health and environment, social medicine division of addiction and mental health, food safety, service of orthoptics and audiological service.

The Ministry of Social Security, akin to the Ministry of Health, is involved with enacting and implementing social policy; in addition, this organization is involved in managing the health insurance, accident, and long term insurance funds. The ministry of family focuses on the long term care insurance funds (Berthet, et al., 2015). The Ministry of Social Security is involved with the operation of the social security scheme. Residents are protected from disability, illness, maternity, occupational hazards, and social risks; social security schemes also cover residents once a certain age limit is reached (Berthet, et al., 2015.

The hospital sector and the primary care/physician sectors are separated in the organizational structure; these two sectors differ in planning, capacity, and payment (Berthet, et al., 2015). Both specialist and primary care services are provided in private practices. Patients are not restricted to "gatekeepers" and do not have to register with a primary care physician, nor do they need a referral for specialty care (Paris, Devaux, & Wei, 2010). The hospital sector provides the majority of specialty care, while the physician sectors focuses on primary care. There are no private hospitals in Luxembourg; hospital care is offered through public hospitals. Patients must have a referral from a physician in order to receive care at these public hospitals (Macherey, 2015). Tertiary care access is limited in Luxembourg, and is provided by neighboring countries; Luxembourg is able to take advantage of its central location in Europe, and outsource the majority of tertiary care (Berthet, et al., 2015; Health Consumer Powerhouse, 2012).

The health care insurance scheme is organized under the Caisse de Nationale Sante (CNS), which translates to National Health Fund. The CNS is the primary source of health insurance for Luxembourgish residents, and is the centralized point of contact/entry to the healthcare system and private health insurance for all residents. Recently, Luxembourg consolidated six health insurance funds into the CNS, in order to centralize management of health insurance funds and improve coordination. The CNS also works in collaboration with commercial insurances, as patients have the option to supplement their compulsory health insurance with secondary health insurances (Caisse nationale de santé, n.d.).

Healthcare Financing and Reimbursement

The above description of the CNS acts as a parlay into the financing aspects of the Luxembourgish healthcare system. There are four major forms of health delivery systems financing. Bismarckian systems follow a joint employer and employee financed system, while the Beveridge model follows a universal, government health insurance system financed completely through taxes (Wallace, 2013). The national health insurance based model combines elements of Beveridge and Bismarckian models, using a tax-

financed model to provider care through private healthcare providers. Finally, an out-of-pocket financing model exists for patients who can afford to pay out of pocket.

Luxembourg follows a compulsory social insurance scheme funded by tax financed contributions from the state, employers, and employed Luxembourgish residents to the CNS, following the Bismarckian system developed by its German neighbors (Berthet, et al., 2015; World Health Organization Regional Office for Europe, 2004). Incentives towards increasing the workforce would also contribute towards sustainability of the health insurance scheme (OECD, 2012, 2015). The majority of healthcare is financed by contributions from employers and employees; only 40% of contributions are from the Luxemburg state (Berthet, et al., 2015). Employees contribute 5.44% of their income towards the national health insurance, contributing a maximum of €6,225 (Macherey, 2015). Luxembourg uses models and forecasts for predicting multi and subsequent year healthcare expenditures, and for determining the budget for the CNS.

Since the CNS is the single payer for all health services, it acts as an insurance plan, in terms of the types of services that are covered and allowed level of payment. The types of services that are covered are a joint decision between the Nomenclature Commission, Ministry of Health, and Ministry of Social Security. The Commission of Nomenclature classifies services provided by health professionals and devices that are covered by the CNS; each service and product covered the CNS is classified by a key and a coefficient. The key letter indicates the monetary reimbursement amount, while the coefficient indicates the related value of each service. The nomenclature can be revised biannually, and is signed by the CNS and professional organizations. As a result, the classification system provides a basis for establishment of collective barging of services and price setting. The Commission on Nomenclature can also expand or reduce the amount of services that will be covered by the CNS. The committee must provide reason as to why a service is being added, deleted, or modified within the CNS market basket. Prices of pharmaceuticals are also determined by the Ministry of Social Security (Berthet, et al., 2015; Government of the Grand Duchy of Luxembourg, 2011; Luxembourg Social Security Institutions, 2017).

Currently, the following service categories are covered by the CNS: medical and professional services from health provides, laboratory and imaging tests, hospital inpatient and outpatient care, medical devices, transportation, rehabilitation, spa, recovery/convalescence, palliative care, preventive medicine, and certain pharmaceutical medications on preferred formularies. Since the benefits for the compulsory national health insurance are comprehensive, voluntary health insurance in Luxembourg does play a major role, and comprises only 4.5% of financing and has not been completely developed (Berthet, et al., 2015). Patients must pay the healthcare costs for health services rendered in advance, and the CNS will then reimburse the patient. Copayments are exempted for patients who have reached their out of pocket limit, children, pregnant women, low-income populations, and those who have certain medical conditions. (Paris, Devaux, & Wei, 2010).

A fee for service payment system is the primary model for reimbursement for physicians, in both primary care and specialty services (OECD, 2015a, 2015b; Paris, Devaux, & Wei, 2010). Hospitals follow a global budgeting system, accounting for operating costs. The CNS negotiates global budgets for each hospital. The CNS also negotiates with the professional organizations representing primary care. Fees that are billed by specialists must be equal to the CNS/third party fees; in other words, specialist providers cannot bill for more than the fees assigned by the CNS and must follow assigned prices. This is unlike the U.S., where providers can bill for amounts larger than assigned amounts, resulting in balanced billing. In addition, in other OECD countries and in the EU, providers can charge any amount or require patients to pay additional amounts on top of services rendered and accommodations; however, this is not practiced in Luxembourg. Similarly, hospitals must follow assigned prices by the CNS, and as mentioned previously, are reimbursed based on a global budget (Berthet, et al., 2015, Paris, Devaux, & Wei, 2010).

EFFICIENCY AND EQUITY: HEALTHCARE SERVICE DELIVERY

The performance of healthcare service delivery within Luxembourg's healthcare system can be rated in terms of customer satisfaction, responsiveness/performance, quality of care, equity, and efficiency

indicators, even though efficiency and equity becomes unreliable and difficult to evaluate. Luxembourg ranks fourth on a recent customer satisfaction survey by the Euro Consumer Health Index, scoring 791 out of a 1000 possible points. The Euro Consumer Health Index rated the healthcare of systems of the countries in the European Union, based on patient rights/information, accessibility, outcomes, prevention, and pharmaceuticals (Health Consumer Powerhouse, 2012). Luxembourg received the highest score for accessibility of healthcare; with 233 out of a possible 250 points. Luxembourg still needs to work on providing healthcare information to patients, as evident in its rating. Furthermore, there is a lack of data on quality, performance of the healthcare system, health plan information, and patient access to any form of health data. In addition, prevention is another discipline that the country needs to improve upon, despite its strong health outcomes. Primary care is not a priority for the country, as patients have free choice of provider and tend to receive specialty services; the country score only 132 out of 175 possible points (Health Consumer Powerhouse, 2012; Paris, Devaux, & Wei, 2010).

The Organization for Economic Co-operation and Development (OECD) collects data on patient healthcare experiences and provides key performance indicators to compare the quality of services provided among its 34 member countries. The healthcare patient experiences in Luxembourg rate above the OECD average measures, as shown in the following Figures 1 - 4. Figure 1 illustrates that in Luxembourg, 95.5% of patients feel that their primary/regular doctor spends enough time with them, compared to the OECD average of 87.1% of patients (OECD, 2013e).

FIGURE 1
REGULAR DOCTOR SPENDING ENOUGH TIME WITH PATIENT IN CONSULTATION, 2010 (OR NEAREST YEAR)

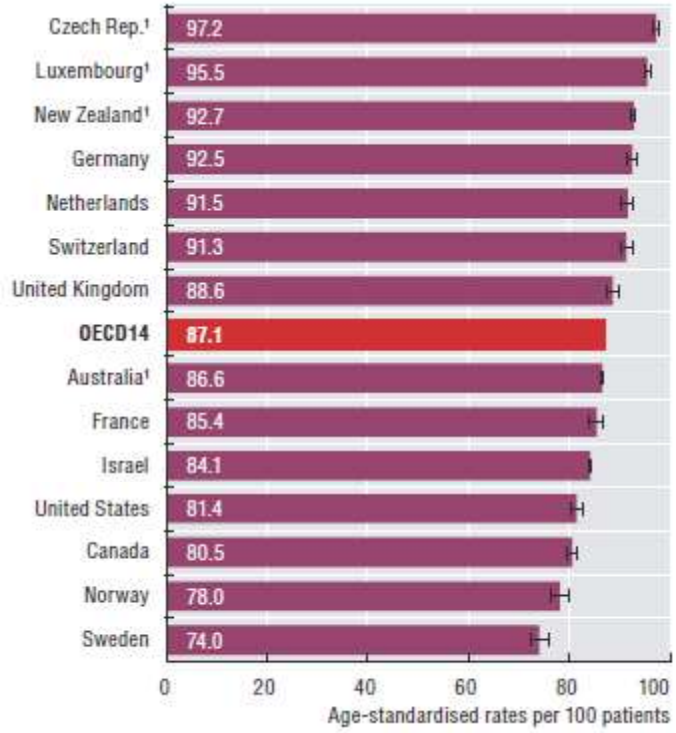


Figure 2 shows that doctors are more likely to provide explanations for medical decisions and treatments which prevent patient confusion (OECD, 2013d). Luxembourg rates the highest in patient doctor communication in OECD nations, as shown in Figure 2 and Figure 3 (OECD, 2013c). Emphasizing shared decision-making allows patients to be empowered during medical decisions and treatment options, and patient-doctor communication helps encourage health behavior modification.

The OECD also reports that Luxembourgish patients believe they are able to openly ask their doctors questions, as illustrated in Figure 4 (OECD, 2013b). This openness in communication results in increasing satisfaction which ensures that health care needs are met and that the patients are receiving appropriate care.

FIGURE 2
REGULAR DOCTOR PROVIDING EASY-TO-UNDERSTAND EXPLANATIONS, 2010 (OR NEAREST YEAR)

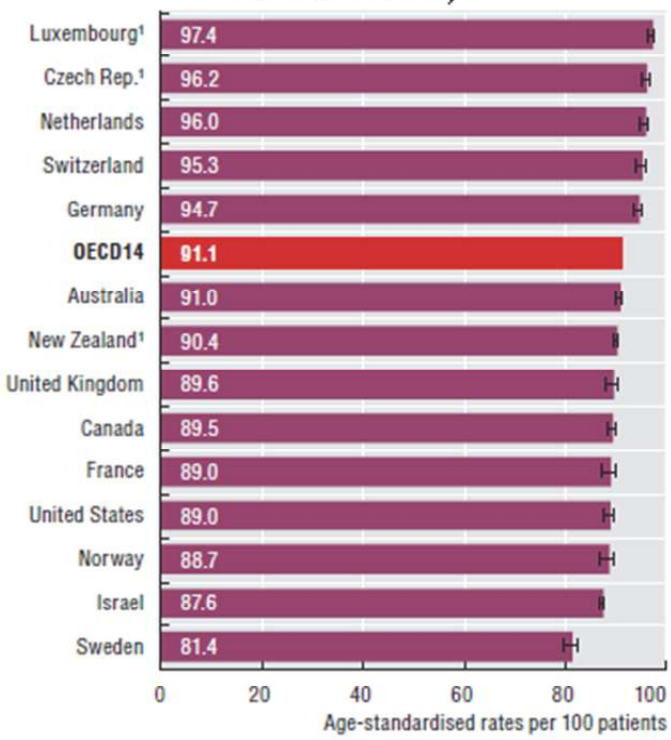


FIGURE 3
REGULAR DOCTOR INVOLVING PATIENT IN DECISIONS ABOUT CARE AND TREATMENT, 2010 (OR NEAREST YEAR)

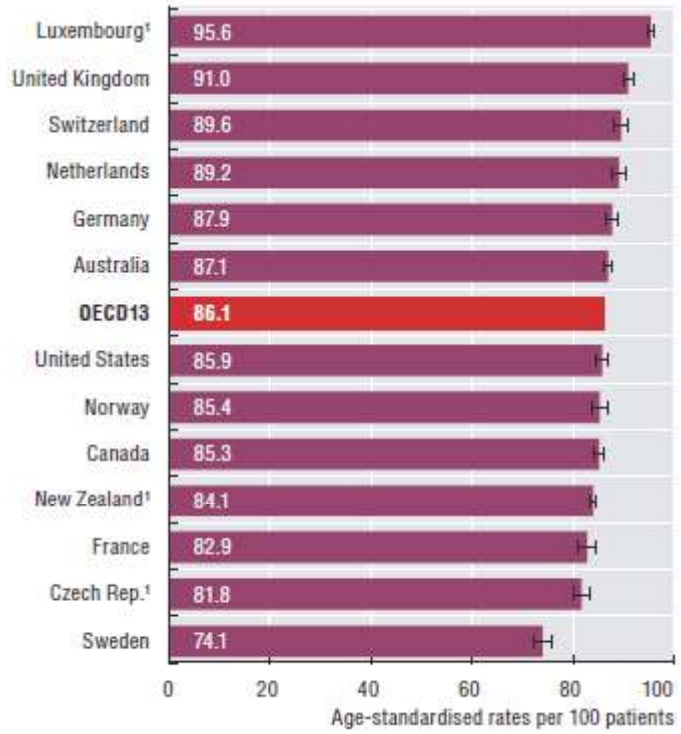
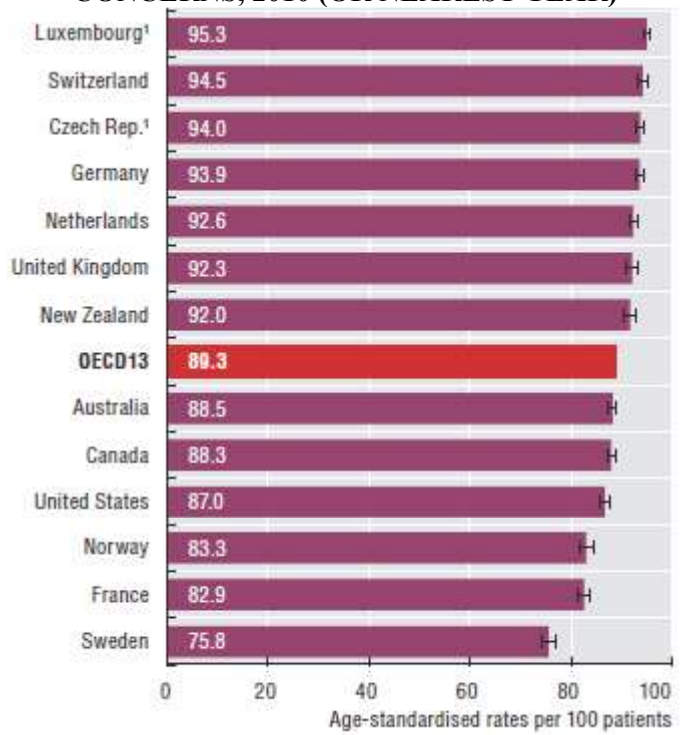


FIGURE 4
REGULAR DOCTOR GIVING OPPORTUNITY TO ASK QUESTIONS OR RAISE CONCERNS, 2010 (OR NEAREST YEAR)



Having the opportunity to ask questions to a doctor and receive easy to understand answers is important for disease management, adherence, changes in health behavior, and health outcomes, especially in vulnerable populations.

Figures 3 and 4 supplement evidence that Luxembourg's healthcare system has a strong focus on patient experience and the patient's perspective of the healthcare system. Patient-doctor communication and shared decision making is a vital element of quality improvement and patient safety. Because of this, Luxembourg rates the highest on patient-reported performance when it comes to effective communication.

Considering the economic implications of equity, health equity can be evaluated in terms of affordability of care, equal access to both preventive and specialized care, health outcomes, and programs to meet health care needs. Luxembourg has specific health programs that are catered to low-income and vulnerable populations (Paris, Devaux, & Wei, 2010). The health system in Luxembourg is effective at providing accessible preventive care services. For example, vaccination rates in Luxembourg are consistently close to 100% over the past decade, which is in contrast to the U.S (Berthet, et al., 2015).

Luxembourg provides specific programs for vulnerable populations which address access to care issues. For example, the country provides low-income populations with services through the tiers-payment-social (TPS), which is a third-party social payment. Since patients have to pay for services in advance before being reimbursed by the CNS, this poses a financial burden for low-income residents living on a restricted or limited income. Patients often cannot afford to pay in advance, resulting in reduced access to services. Low-income patients might have to restrict which providers and services they access in order to accommodate their weekly, or monthly, budget. The TPS aims to solve these issues associated with financial burden, providing low-income patients with a certificate and a list of covered services (Macherey, 2015). Patients present this certificate when receiving services, and CNS will directly pay the provider (physician, pharmacy, hospital, etc.). The list of covered services helps the patient coordinate the TPS payments to the provider; in other words, the patient must present the list to the provider, and the provider submits the list to the CNS to receive respective payment. Similarly, for prescriptions, the pharmacist needs to submit the prescription and the list to obtain payment. All Luxembourg's residents can qualify for TPS. TPS is usually granted for 3 months, 6 months, or 1-year time periods, and after 3 months residents can ask for an extension. However, the homeless have to rely on other mechanism for accessing healthcare, as social support and healthcare are linked to a resident's address, reducing the effectiveness of this social program (Macherey, 2015).

Refugees and asylees are provided free basic healthcare, and coverage of services is equivalent to a Luxembourgish resident. A monthly allowance, housing and food are provided at no cost, as well. Asylees can apply for emergency care within the first 3 months of their stay. Although refugees and asylees have access to care, undocumented migrants have no right to healthcare in Luxembourg. Unaccompanied and undocumented children are provided health care coverage; however if the child is accompanied by an adult, healthcare is not provided. This results in reduced access to quality healthcare and preventive services (Macherey, 2015).

For the Luxembourgish population with certain chronic diseases, such as HIV/AIDS, six health centers located across Luxembourg provide free and anonymous care for HIV infected patients. Luxembourg has also recently formed a committee on infectious disease, to improve access to care for patients with other infectious diseases (Macherey, 2015).

On the other hand, like the U.S., Luxembourg needs to improve health system efficiency and performance. Luxembourg needs to start incorporating priority setting, to seek improved efficiency gains. The market baskets for health are not clearly defined in Luxembourg, let alone actually conducting economic evaluations or health technology assessments (HTA) of health services. Health technology assessments do not inform which services are covered in the market basket of Luxembourg's CNS, unlike most states in the European Union (Berthet, et al., 2015). In addition, increased availability of information for patients would increase competition in the market. In addition, the implementation for gatekeeping and incentives towards primary care would increase efficiency, creating appropriate outpatient care utilization (OECD, 2010).

As of 2010, Luxembourg passed laws to implement reform of its healthcare system, instituting medical expertise cells (Cellule d'expertise médicale- EMC) that are administratively under the General Inspectorate of Social Security (below the Ministry of Social Security), as an initial step towards incorporating health technology assessments and evaluation of services in the healthcare system. Luxembourg is a part of the EU Cooperation on Health Technology assessment network (European Commission Directorate-General for Health and Food Safety, n.d.).

The EMC addresses requests from the commission of nomenclature; Luxembourg's process of working towards HTA's is still in the initial stages. The EMC relies on literature reviews, scientific research, work with external bodies and evaluating results from other neighboring countries, rather than a formalized guidelines and process HTA, economic evaluations and cost analyses. Costs have not been incorporated into these preliminary HTAs. This preliminary form of HTA does not directly influence the commission on nomenclature (Inspector General of Social Security for the Government of the Grand Duchy of Luxembourg, 2015). The implementation of an HTA is especially imperative in countries such as Luxembourg, as choice is a key feature of the healthcare system.

Since hospitals are operating on a prospective global reimbursement system and economic disincentives, inefficiencies and waiting lists can arise with lack of hospital supplies, due to budget constraints (Paris, Devaux, & Wei, 2010).

From the consideration of healthcare professional supply and demand, Luxembourg faces similar issues to the United States, due to declining supply of physicians and increasing demand for medical care. The number of medical students is not regulated; there are no quotas for medical students to select certain specialties. Luxembourg is one of the few countries that do not regulate medical students, and the only country that does not incorporate any form of regulation for health professionals, capacity planning, and geographic distribution of physicians (Paris, Devaux, & Wei, 2010). Luxembourg does not have an official medical school; medical students can study only their first year at the University of Luxembourg, and then must complete school outside the country. Medical schools in Belgium, France, or Germany have only limited placements for Luxembourgish medical students. A medical school in Luxembourg is in the planning stages, but is affected by budget cuts from the University of Luxembourg (Beffort, 2014). Luxembourg will be facing issues with health professional shortages soon, and is ill prepared to deal with the training capacity needs to address shortages (Berthet, et al., 2015); the country has a below average number of practicing physicians at 2.9 per 1000 individuals (Paris, Devaux, & Wei, 2010)..However, the number of nurses is high (11.9 per 1,000 residents), while the number of practicing physicians is low (Berthet, et al., 2015).

The country does not have any policies in place to address medical staff shortages (Berthet, et al., 2015; OECD, 2013a; Paris, Devaux, & Wei, 2010). Due to the small size of the country and its healthcare workforce, Luxembourg attracts cross border care and health professionals. One aspect that is attractive about working in Luxembourg is the high salary provided for health workers. In addition, Luxembourg has several trade unions that represent the healthcare section and health professionals Castegnaro & Claverie, 2011). As per the constitution, employees have the right to collective bargaining and striking; however, by law, paramedics are prevented from going on strike, due to the healthcare capacity implications involved. There are two collective bargaining agreements in the healthcare sector, and more than 80% (approximately 20,000 individuals) of the healthcare professionals are covered by at least one of the two major collective bargaining agreements. In the recent years, there have been some conflicts due to providers switching collective bargaining agreements, as another trade union provided more advantageous working conditions. Striking is rare in the health professions; however, there were disagreements regarding pay inequity for nurses that lead to a demonstration (Castegnaro & Claverie, 2011).

At the hospital level, hospital authorities control the recruitment/supply and pay of medical staff, while hospital authorities negotiate with local health profession authorities. The central government is in charge of setting national pay scales for other health professions. Luxembourg regulates hospitals and the increase of hospital beds, construction of new hospitals, high cost specialized technology, capital

investment, and services provided at the central level. Hospitals negotiate services and reimbursement with the CNS (Paris, Devaux, & Wei, 2010).

In addition, patients have access to free care. The quality of care is high, therefore healthcare in Luxembourg is highly ranked (Berthet, et al., 2015). The overall life expectancy in Luxembourg is 81.9 years. Women have a life expectancy of 83.9 years which is higher than men's 79.8 years (OECD, 2013a). Seventy six to 100% of costs for acute inpatient care, outpatient care/primary care, outpatient specialist, lab test, and diagnostic imaging care covered (Paris, Devaux, & Wei, 2010).

Specialty care is indirectly incentivized, as there are no direct incentives or bonus for primary care physicians (Paris, Devaux, & Wei, 2010), so physicians earn more by providing more care. The Luxembourgish primary care system being ranked lower in comparison with neighboring EU countries. There are 6.6 outpatient contacts in Luxembourg, which is lower than the OECD average (Berthet, et al., 2015). Thus, the lack of focus on continuity of care for chronic disease management, prevention, and primary care has led to increased prevalence of chronic disease; for example, 59.6% of residents over the age of 15 are obese or overweight. There is no mammography equipment available at ambulatory care settings, thus patients must go to a hospital to receive screening services; however, patients need referrals to receive care at hospitals. In addition, Luxembourg is one of 3 countries with the lowest number of mammography equipment availability, with only 9.2 machines in hospitals per 1 million residents (i.e. 4.51 machines in the entire country of 500,000 people). Hospitals receive bonus payments, although these payments are not directly dependent on outcomes, and hospitals are reimbursed patient days based on patient need. The average length of stay in an acute care setting is 7 days (OECD, 2016; Paris, Devaux, & Wei, 2010).

Overall, however, as mentioned previously, there is a lack of access to data or information on Luxembourgish healthcare or healthcare system performance. Information about pricing of services are not available to patients; overall, there is a lack of data regarding health system performance. Data is not available on clinical outcomes, patient satisfaction, experiences, provider comparison, or referral selection (Paris, Devaux, & Wei, 2010).

Pharmaceuticals

Pharmaceutical spending and its share of the GDP has not increased over the years in Luxembourg. The country spends little on pharmaceuticals in terms of public expenditures (Carone, Schwierz, & Xavier, 2012). In absolute terms, pharmaceutical expenditures in Luxembourg have not strongly increased in respect to GDP per capita; however, it will remain a priority to ensure that Luxembourg can maintain its position. Not surprisingly, a majority of pharmaceutical expenditures in Luxembourg are publicly financed (Vogler & Habimana, 2014). Prices are set in the country where the pharmaceutical product is from which the product is imported (Paris, Devaux, & Wei, 2010). In terms of pharmaceutical product financing, the CNS directly reimburses pharmaceutical products using a 3-tier system of reimbursement. Unlike other services and devices, pharmaceuticals are directly reimbursed by the CNS. Reimbursement rates are provided at 40%, 80%, and 100% of pharmaceutical costs, depending on the severity of illness, the availability of substitutes or generics, and the resulting out of pocket costs for the patient (Berthet, et al., 2015). Currently, Luxembourg does not focus primarily on policies to address pharmaceutical pricing as part of its health agenda.

Reference pricing is used to control pharmaceutical costs, although it has been applied to reimbursement of other health services as well. A reference and decision criteria is used to determine the maximum reimbursement rate Carone, Schwierz, & Xavier, 2012). The country uses external reference pricing, using the lowest price from the country of origin as the basis for pricing decisions. External reference pricing is "applied for all marketed drugs" (Remuzat et al., 2015), and all countries are considered in the scope of evaluation. The reference country chosen for reference pricing varies by country in the EU, and usually is a neighboring country, or a country with similar economic characteristics. The country of origin is used as the reference for "country baskets" used in external reference pricing (Carone, Schwierz, & Xavier, 2012). However, it is not clearly established as to whether the country of origin is the country performing the manufacturing or performing the marketing (Rémuzat,

et al., 2015). Luxembourg does not incorporate internal reference pricing which is an evaluation against similar groups of pharmaceuticals. The translation of external reference pricing and its impact on the reduction of pharmaceutical prices and cost is uncertain. It is unlikely that Luxembourg will have made an impact on its pharmaceutical expenditures, as price comparisons between countries are affected by discounts, and differences in list versus effective prices (Carone, Schwierz, & Xavier, 2012).

Luxembourg is one of the few member states of the EU that allow up to 10% of pharmaceutical sales within the country direct from the manufacturer (Kanavos, Vandoros, Irwin, Nicod, & Casson, 2011). Luxembourg also uses direct price controls and international price comparisons (Mossialos, Mrazek, & Walley, 2004). The country does not incorporate public bidding mechanisms for pharmaceutical purchasing Carone, Schwierz, & Xavier, 2012). The average margin on the pharmacy retail price is 48% and pharmacy markup is linear with price. Wholesaler markup varies by the country of origin of the medication. Luxembourg also implements policies to encourage appropriate prescription performance. Luxembourg monitors prescriptions, encourages international-non-proprietary name (active ingredient) /generics, and sets prescription guidelines targeting physicians (Carone, Schwierz, & Xavier, 2012; Mossialos, Mrazek, & Walley, 2004). However, these policies are not mandatory and physicians are not offered financial incentives towards appropriate prescribing or meeting prescription quotas. Generic substitutions of brand name medications by pharmacists were banned in Luxembourg which was a missed opportunity for pharmaceutical savings. If the prescription was written using the generic name, then pharmacists could source product that is not brand name (Carone, Schwierz, & Xavier, 2012; Mossialos, Mrazek, & Walley, 2004). In 2014, the country passed a new measure that allows pharmacists to advise patients on the use of generic medications, in phases, beginning with the categories of statins and peptic ulcers/acid reflux medications. According to estimates in 2015, Luxembourg has saved approximately 2 million euros due to the substitution of generics, and the use of brand name medications fell, while generic mediation usage doubled (Luxemburger Wort, 2014, 2015).

Information Technology

However, Luxembourg is beginning to move towards eHealth and Heath IT, as well as big data in health care. Luxembourg has started hosting a national Health Summit since 2014; the topic of the Health Summit in 2016 was to focus on eHealth and big data initiatives applications for patient health/experience (Luxembourg Healthcare Summit, 2017). Luxembourg has made strides towards electronic health record implementation and connectivity. Currently, health care organizations in Luxembourg are connected by the eHealth agency using the telematics platform known as HealthNet (Agence nationale des informations partagées dans le domaine de la santé ou Agence e-Santé, n.d.).. HealthNet incorporates telemedicine, databases, prescribing and patient files, and new initiatives to foster patient communication and data accesses. The governmental eHealth agency also aimed to foster interoperability, coordination of data, and improve patient access to information by creating a version of an electronic health record for shared data, known as the shared health record (DSP) (Agence nationale des informations partagées dans le domaine de la santé ou Agence e-Santé, n.d.). The DSP does not replace a provider's records, nor is it a standalone health record. It is similar to a health record bank, where patients and providers can make withdrawals and deposits into the DSP. The DSP works in function with the telematics platforms. The economic crisis, as detailed below, was another incentive towards improving and expanding efforts in shared data and communication (Eurofound, 2014).

Challenges for the Luxembourgish Healthcare System

As with EU countries and Bismarckian insurance systems, healthcare in Luxembourg is financed through social contributions; thus during a recession, per capita income and contributions by employees will be reduced, resulting in constraints for healthcare. Luxembourg was hit by one of the later waves of the most recent economic crises. Since the economy was strong, the country was able to protect itself against the economic crisis by implementing fiscal spending measures at the beginning of the recession. Vulnerable populations and minorities have not faced issues with access to care, as of yet; from 2011 to 2012 there was an increase in the social assistance provided, as well as an increase in the proportions

spent on health. The TPS system is a major source of support for those who cannot afford to pay for health services in advance, and as of 2013, the European Anti-Poverty Network Lëtzebuerg help the homeless by covering the cost of insurance (Eurofound, 2014). To supplement such financial measures, Luxembourg has maintained a focus towards long term sustainability, in addition to addressing the short term issues associated with the economic crisis and preventing slipping further into the recession. For example, health care reform measures have been one of the long-term foci to addressing the future after the recession.

Although spending cuts have started to emerge in Luxembourg after 2012, the economic crisis has hardly resulted in major reductions in services in Luxembourg; there still have been issues with access to care. Issues associated with mental health policy implementation were due to a lack of provider experience with mental health, stigma, and the fragmentation and structure of the healthcare system, rather than the economic crisis at hand. The recession did not exacerbate issues with the implementation for mental health policies. For healthcare providers, a maximum budget has been set, with reduced payments for services above the maximum. When evaluating where public expenditures reduced the most among countries in the EU, Luxembourg was in the top quartile (Eurofound, 2014).

CONCLUSION

There is a considerable need for reducing health care spending, especially as expenditures are above OECD average. Luxembourg is similar to the United States, in that both of these countries have a strong economy with a fragmented healthcare system and high expenditures. Both countries lack a focus on primary care and chronic disease management; although Luxembourg provides a more affordable, comprehensive health benefit basket, and enhanced patient experience. From the perspective of efficiency and availability of pricing information, Luxembourg is similar to the United States. Unlike the U.S., Luxembourg is a landlocked country, nestled in the EU; thus, cross-border care is another one of the major health system challenges the country is facing, as there are no restrictions that are currently placed on provision of cross border care. Making further use of healthcare in bordering countries would increase health system efficiency (OECD, 2012); especially due to the lack of specialty and tertiary care facilities in Luxembourg itself.

The United States healthcare system organization consists of often siloed, standalone hospitals, physician practices, laboratory services, outpatient hospital practices, alternative care, and pharmacies. In addition, there are many organizations formed for improved service delivery, such as physician-hospital organizations, integrated delivery systems (one stop shop for health services, laboratory services, and financing), and recently, accountable care organizations, and medical homes. The siloing of healthcare also makes it harder to substitute, while substitution elasticity is fairly elastic at the individual practice level, at the market level elasticity becomes fairly inelastic, as healthcare becomes an essential good.

Further, health financing organizations are organized separately from service delivery organizations, through private (individual or employer based) or public insurance (Medicaid, Medicaid, Children's' Health Insurance Program, TRICARE, or Indian Health Services). Health insurance is primarily employer financed. While Luxembourg follows a Bismarckian healthcare system, the United States uses a combination of all 4 types of financing, for different patient sectors (Wallace, 2013). For the elderly, Medicare acts like a National Health Insurance Scheme, while for the Veteran population (TRICARE), healthcare delivery is similar to the Beveridge based system models. Employer based insurance in the United States provides care similar to Luxembourg. However, the use of multiple health systems for multiple patient populations creates confusion and inefficiency, as well as results in inequities and low health system performance. Inherent reimbursement economic disincentives from third party payment and agency relationships apply to both countries, creating over and underutilization of healthcare, adverse selection, and unnecessary care.

For both the United States and Luxembourg, the supply of health professionals is a pressing issue in the healthcare system, as there is an increasing demand for services from the aging population and chronic diseases. Physician supply is dwindling due to the increased years of education involved, and

Luxembourg is further ill equipped due to the lack of an in-country medical school for training. The U.S. faces issues with developing STEM education; making accelerated education programs available would aid displaced workers and encourage STEM education. Both the U.S. and Luxembourg face faculty shortages for health professional training; further developing partnerships between health institutions and creating opportunities for mentoring would benefit both countries for improving increased health professional training. Luxembourg would further benefit from a centralized system and standardized requirements for reporting for medical school student placement after first year in home training, as this has been developed within the U.S. within the state of Michigan (Public Sector Consultants, 2008). Finally, regional variation in shortages for both countries needs to be addressed; Luxembourg could also consider the use of regulation for health professionals, and evaluating rural areas of the country that have higher health needs or shortages.

Health economics is an important consideration for the country; currently, there is no focus on efficiency or financial incentives to promote value for care. As in the United States, Luxembourg does not incorporate economic evaluation and health technology assessments in reimbursement or coverage options. In addition, recent reforms were implemented to the nomenclature commission, to ensure that the addition, deletion, or modification of a reimbursed services was clearly justified. The health technology assessments conducted by the EMC are preliminary in nature, and do not consider costs. In addition, although the EMC provides information about services covered by the CNS, there are no criteria or incentives to promote economically viable options. However, there are no requirements that the recommendations from the EMC must be implemented in the CNS. Economic evaluation needs to be further considered in the context of public health priority and decision making, especially with preventive conditions and managing costs. The health system efficiency can be easily improved with a focus on cost containment and health organizational empowerment (Berthet, et al., 2015; OECD, 2012).

Luxembourg has made better strides than the U.S. in electronic health records, shared health data, and telemedicine technologies. However, since the country only operates public hospitals, it seems to be considerably easier to link and connect government based healthcare organizations than fragmented, public, and private organizations, with multiple technologies and platforms, health systems, and organizational needs, as is the case in the United States. The implementation of shared health data and electronic health records at the country, then state, then regional level should be evaluated in the United States (Mantravadi, 2016). Health record banks have been created in several states (Mantravadi, 2016). The level of electronic technology in Luxembourg can also be used to integrate clinical simulation for medical student training as well. Opportunities are available to use predictive analytics and artificial intelligence applications to leverage the knowledge within the electronic health record databases for better diagnoses and patient outcomes (Hoyt, Snider, Thompson, & Mantravadi, 2016).

Similar to the U.S., reference-pricing needs to be applied to other health services, other than pharmaceuticals. In addition, there is a dearth of information available on health care system performance. Transparency in health information, both in the US and in Luxembourg, would increase health system efficiency, due to improved flow of information (OECD, 2012) to address asymmetric information and agency relationships. Residents, if opting to choose a voluntary, supplementary insurance have no means to compare health plans, let alone providers. Thus, it is hard to evaluate health system effectiveness, without data on appropriate metrics, as no patient information is provided, and health needs assessments or evaluations are not conducted. Capitalization on available data and eHealth infrastructure is the next major goal for the country; Luxembourg has been trying to foray into personalized medicine and big data ventures (Luxembourg Healthcare Summit, 2017; Presidency of the Council of the European Union, 2015), and the United States is now beginning to consider the health impacts of these approaches. The yearly countrywide Health Summit conferences provide a venue for enabling conversation and sharing tools on health care system performance. Luxembourg is engaging in conversations towards the state of the healthcare system, and its future, as is the United States with renewed focus on health outcomes and economic research, and translation towards health system performance.

REFERENCES

Agence nationale des informations partagées dans le domaine de la santé ou Agence e-Santé. (n.d.). *Healthnet*. Retrieved from https://www.esante.lu/portal/fr/espace-professionnel/healthnet,370,375.html

Beffort, B. (2014). Luxembourg Medical School planning continues. *Luxemburger Wort*, p. 1.

Berthet, F., Calteux, A., Wolter, M., Weber, L., van Ginneken, E., & Spranger, A. (2015). *Health systems in transition: Luxembourg.* Copenhagen: World Health Organization. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0006/287943/Mini-HiT_Luxembourg-rev1.pdf?ua=1

Caisse nationale de santé. (2017). *CNS Luxembourg.* Retrieved March 3, 2017, from http://www.cns.lu/

Carone, G., Schwierz, C., & Xavier, A. (2012). Cost-containment policies in public pharmaceutical spending in the EU. *European Economy Economic Papers 461*, pp. 1-67.

Castegnaro, G., & Claverie, A. (2011). *Luxembourg: Industrial Relations in the Health Care Sector.* Retrieved from https://www.eurofound.europa.eu/observatories/eurwork/comparative-information/national-contributions/luxembourg/luxembourg-industrial-relations-in-the-health-care-sector

Digital Luxembourg. (2016). *Luxembourg Healthcare Summit focuses on patient experience and e-health.* Retrieved from http://www.digital-luxembourg.public.lu/en/actualites/e-health/2016/conf-e-sante/index.html

Eurofound. (2014). *Access to healthcare in times of crisis.* Luxembourg: Publications Office of the European Union.

European Commission Directorate-General for Health and Food Safety. (n.d.). *Health Technology Assessment Network.* Retrieved from http://ec.europa.eu/health/technology_assessment/policy/network/index_en.htm

Government of the Grand Duchy of Luxembourg. (2011). *Grand-Ducal Regulation of 30 July 2011 on the functioning of the Commission on the nomenclature of acts and services covered by sickness insurance.* Luxembourg: Legilux. Retrieved from http://legilux.public.lu/eli/etat/leg/rgd/2011/07/30/n6/jo

Government of the Grand Duchy of Luxembourg. (2017). *News from the Government of Luxembourg*. Retrieved from http://www.gouvernement.lu/

Health Consumer Powerhouse. (2012). *Euro Health consumer Index 2012.* Retrieved from http://www.healthpowerhouse.com/files/Report-EHCI-2012.pdf

Hoyt, R. E., Snider, D. H., Thompson, C., & Mantravadi, S. (2016). IBM Watson Analytics: Automating visualization, descriptive and predictive statistics. *Journal of Medical Internet Research-Public Health Surveillance, 2*(2), e157.

Inspector General of Social Security for the Government of the Grand Duchy of Luxembourg. (2015). *Rapport d'activité 2014: Cellule d'expertise médicale.* Retrieved from http://www.mss.public.lu/acteurs/igss/cem/cem_rapport_2014.pdf

Kanavos, P., Vandoros, S., Irwin, R., Nicod, E., & Casson, M. (2011). *Differences in costs of and access to pharmaceutical products in the EU.* Brussels: European Parliament.

Luxembourg Healthcare Summit. (2017). *Luxembourg Healthcare Summit*. Retrieved from http://www.itone.lu/evenements/luxembourg-healthcare-summit-2017

Luxembourg Social Security Institutions. (2017). *Relations dans le secteur extrahospitalier Art. 65.* Retrieved from http://www.secu.lu/assurance-maladie/livre-i/chapitre-v-relations-avec-les-prestataires-de-soins/relations-dans-le-secteur-extrahospitalier/art-65/

Luxemburger Wort. (2014). *Luxembourg rolling out generic drugs.* Retrieved from http://www.wort.lu/en/luxembourg/healthcare-luxembourg-rolling-out-generic-drugs-540d98ddb9b39887080616c3

Luxemburger Wort. (2015). *Generic drugs saved CNS 1.6 million euros.* Retrieved from https://www.wort.lu/en/luxembourg/health-service-savings-generic-drugs-saved-cns-1-6-million-euros-556595db0c88b46a8ce5a029

Macherey, A. L. (2015). *Legal report on access to healthcare in 12 countries.* Paris: Doctors of the World – Médecins du monde International Network.

Mantravadi, S. (2016). *Future of health record banking in hospital referral regions.* Retrieved from American Journal of Managed Care: http://www.ajmc.com/contributor/s-mantravadi/2016/09/future-of-health-record-banking-in-hospital-referral-regions

Mossialos, E., Mrazek, M., & Walley, T. (2004). *European Observatory on Health Care Systems Series: Regulating pharmaceuticals in Europe: striving for efficiency, equity and quality.* Berkshire, England: Open University Press.

OECD. (2010). *Health care systems: Getting more value for the money.* Retrieved from http://www.oecd.org/eco/growth/46508904.pdf

OECD. (2012). *OECD Economic Surveys: Luxembourg 2012.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/eco_surveys-lux-2012-en

OECD. (2013a). *Health at a Glance 2013: OECD Indicators.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-en

OECD. (2013b). Regular doctor giving opportunity to ask questions or raise concerns, 2010 (or nearest year). In *Health at a Glance 2013.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-graph130-en

OECD. (2013c). Regular doctor involving patient in decisions about care and treatment, 2010 (or nearest year). In *Health at a Glance 2013.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-graph131-en

OECD. (2013d). Regular doctor providing easy-to-understand explanations, 2010 (or nearest year). In *Health at a Glance 2013.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-graph129-en

OECD. (2013e). Regular doctor spending enough time with patient in consultation, 2010 (or nearest year). In *Health at a Glance 2013.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-graph128-en

OECD. (2015a). Fostering the emergence of innovative industries. In *OECD Economic Surveys: Luxembourg 2015* (pp. 79-114). Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/eco_surveys-lux-2015-en

OECD. (2015b). *Government at a glance 2015.* Retrieved from http://www.oecd.org/gov/Luxembourg.pdf

OECD. (2016). *OECD Data*. Retrieved from https://data.oecd.org/searchresults/?r=%2Bf%2Ftype%2Findicators&r=%2Bf%2Ftopics_en%2Fhealth

OECD. (2017). *Health Care Quality Indicators - responsiveness and patient experiences*. Retrieved from http://www.oecd.org/els/health-systems/hcqi-responsiveness-and-patient-experiences.htm

Paris, V., Devaux, M., & Wei, L. (2010). Health systems institutional characteristics: A survey of 29 OECD countries. In *OECD Health Working Papers, No. 50.* Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/5kmfxfq9qbnr-en

Presidency of the Council of the European Union. (2015). *Making Access to Personalised Medicine a Reality for Patients.* Retrieved from http://www.eu2015lu.eu/en/actualites/communiques/2015/07/08-medecine-personnalisee/index.html

Public Sector Consultants. (2008). *Strategies to Address Shortages in the Health Professions.* Retrieved from www.michigan.gov/documents/healthcareworkforcecenter/shortagestrategies08_239085_7.pdf

Rémuzat, C., Urbinati, D., Mzoughi, O., El Hammi, E., Belgaied, W., & Toumi, M. (2015). Overview of external reference pricing systems in Europe. *Journal of Market Access & Health Policy, 3*(1). Retrieved from http://dx.doi.org/10.3402/jmahp.v3.27675

The World Bank Group. (n.d.). *GINI index (World Bank estimate)*. Retrieved from http://data.worldbank.org/indicator/SI.POV.GINI?locations=LU

U.S. Centers for Medicare & Medicaid Services. (2016). *Historical - Centers for Medicare & Medicaid Services.* Retrieved from https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nationalhealthaccountshistorical.html

Vogler, S., & Habimana, K. (2014). *Pharmaceutical pricing policies in European countries.* Vienna: Gesundheit Österreich Forschungs- und Planungs GmbH. Retrieved from http://whocc.goeg.at/Literaturliste/Dokumente/BooksReports/GOe_FP_Pharmaceutical_Pricing_Europe_CtW_final_forPublication.pdf

Wallace, L. S. (2013). A view of health care around the world. *Annals of Family Medicine, 11*(1), 84.

World Health Organization Regional Office for Europe. (2004). *Highlights on health in Luxembourg.* Copenhagen: WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0016/103561/E88551.pdf