



A population based economic analysis of cross-border payments for fertility services in Luxembourg

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Abstract

Objective: How fertility patients utilise assisted reproductive services can depend on how easy it is to access such services locally. Little data exist to document the extent of economic outflow that accompanies cross-border patient travel specifically for medical procedures that cannot be obtained in country.

Methods: In this investigation, data from Luxembourg's social security agency were used to audit medical reimbursement payments for IVF within and outside the Grand Duchy of Luxembourg between 1998 and 2007. This study interval offered an opportunity to track IVF expenditures before and after IVF was made freely available within the Grand Duchy.

Results: Reimbursement authorizations to IVF providers outside Luxembourg remained stable or slightly elevated until 2005, two years after Luxembourg opened its first IVF centre. Once established in Luxembourg, annual utilisation of the domestic IVF service generally trended upwards (217 cycles in 2003 vs. 569 in 2008). Meanwhile, payments to foreign IVF clinics declined steadily after 2005 reflecting a diminishing number of Luxembourg patients seeking cross-border IVF treatment.

Conclusion: These data represent the most comprehensive register of cross-border reproductive visits in Europe. Since Luxembourg fully reimburses its citizens for health-related expenses irrespective of where the medical service is obtained, the current investigation renders the "out of pocket" effect of IVF fees irrelevant and characterise consumption of elective medical treatments as a function of service site. Further studies are needed to determine if these findings will generalise to other geographic regions.

Introduction

Procedures such as in-vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) allow as many as one third of women who would otherwise remain childless to conceive. Although more than half of all recorded cycles of in vitro fertilization (IVF) worldwide have been undertaken in Europe [1], there remains considerable diversity

in European public funding strategies for treating infertility [2]. Of equal importance, there is a lack of consensus on how countries should use limited public resources to treat infertility [3]. Whereas gynaecologists in the more populated European countries tend to routinely treat patients with fertility problems, practitioners in smaller

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Table 1.

Annual assisted fertility service payments associated with Luxembourg fertility patients designated to medical providers outside the Grand Duchy of Luxembourg, 1998–2007.

Year	Patients (n)	Foreign ART disbursement authorizations (n)
1998	491	1054
1999	449	961
2000	421	815
2001	526	1015
2002	480	932
2003 ^a	493	977
2004	562	1041
2005	517	928
2006	304	532
2007	278	450

^aIn 2003, assisted reproductive treatments became locally available for the first time within Luxembourg

countries often refer their Assisted Reproductive Technologies (ART) patients to neighboring jurisdictions, particularly when specialist facilities are not available locally or where tighter fiscal policies govern assisted conception [4–7].

The Grand Duchy of Luxembourg, with its present population of slightly less than a half million inhabitants, did not immediately embrace the advanced reproductive technologies when these first became available. As a result, patients requiring medically assisted reproductive techniques had no option other than to seek care outside of their home country. This *de facto* system of recourse to foreign competencies for reproductive care was useful for a small nation, especially as patient expenses for treatments obtained in neighbouring Belgium, France and Germany (99.8% of all foreign care authorizations) were reimbursed at full cost by Luxembourg's healthcare system.

Despite the advantages of a centralized, single-payer system in Luxembourg, the medical establishment recognized that recourse to foreign medical care, often requiring numerous follow-up appointments, added considerable stress to couples who were already under pressure because they were unable to achieve a healthy pregnancy. Accordingly, plans were eventually undertaken to offer ART by way of a specialized clinic located in the maternity building at the *Centre Hospitalier de Luxembourg*. Today, in terms of professional staff, this fertility unit comprises eight doctors, one embryologist, four technicians, and two midwives. Although no specific laws govern the practice of ART in Luxembourg, this clinic abides by European standards of medical practice and the French Bioethics Laws of 1994 [8]. Since its launch in 2000, the Luxembourg Fertility Clinic has performed 2,737 cycles of ART for couples who otherwise would have required treatment in a foreign country (Table 1). In addition, this facility has collected outcomes data on the demographics and effectiveness of every ART procedure it has administered

(Table 2). These data are submitted to the Ministry of Health and Social Security and studied to determine the need for ongoing quality improvements to methodologies and practices. Because medical records are computerized, population-based analyses can be conducted.

The information system of the Luxembourg social security agency can retrospectively audit medical care consumption and demographic variables of patients receiving reimbursement payments for healthcare within and outside the Grand Duchy of Luxembourg. Such data represent the most comprehensive register of cross-border reproductive visits by any group of individuals in Europe.

Methods

Medical care consumption and demographic data were collected by the Administration of the Medical Control of the Social Security System (CMSS) of Luxembourg for all foreign care authorizations since 1998. Services obtained outside the Grand Duchy included magnetic resonance imaging, coronary bypass grafting, treatments of malignant tumours, and infertility. Our study included all patients who received treatments for infertility outside the Grand Duchy since data started being recorded in 1998, and all patients who received ART services inside the Grand Duchy after these services became available locally in 2003. All data were tabulated in an anonymous and non-identifiable manner, in accordance with standards prescribed by our institutional review panel. The database comprised 181,231 patient encounters, analysed with SAS Version 9.2. A total of 22,803 care authorizations were excluded from analysis based upon truncated data obtained in 2008, refused claims, or pending care authorizations. A total of 158,428 care authorizations (for 48,514 patients) were included for study.

Results

Before 2003, any patient in Luxembourg who needed specialist ART consultation did so outside of Luxembourg.

Table 2.

Summary of reproductive outcomes following IVF in Luxembourg, 2003–2008.

Year	Initiated cycles (n)	Clinical pregnancy/ET (%)
2003	217	30.0
2004	259	36.4
2005	246	36.8
2006	379	36.4
2007	537	32.0
2008	569	42.7

Notes: Data describe treatment activity at the only IVF provider in the Grand Duchy of Luxembourg, *Centre Hospitalier de Luxembourg*. ET = embryo transfer.

Table 3.

Overview of IVF activity in selected E.U. jurisdictions (2004).

Country	Reporting IVF Clinics (n)	Number of IVF Cycles	Total Population (n)	ART cycles/1,000 Population
Iceland	1	234	293,577	0.80
Luxembourg	1	259	454,960	0.57
Belgium	18	13,794	10,445,852	1.32
United Kingdom	74	18,375	59,846,000	0.31
France	100	55,217	60,963,000	0.91
Germany	120	38,824	82,500,849	0.47

Note: Non-Luxembourg data derived from ESHRE reports (Hum Reprod 2008;23:756–71).

An inflection point was observed in 2003, the year in which the first specialized ART centre opened within Luxembourg. This unique circumstance provided an opportunity to examine before- and after-patterns of ART care within a defined population where cost factors could be closely monitored. National reimbursement authorizations assessed during the study interval revealed that recourse to foreign ART services outside of Luxembourg remained stable or slightly elevated until 2005 (Table 1). Subsequently, utilisation of foreign care providers declined and, as expected, the country's domestic uptake of ART services increased (Table 2). In terms of medical care utilization, considering the elective nature of fertility treatments, the 8,705 foreign care authorizations (see Table 1) surpasses the 10yr aggregate total of 2,451 authorizations for radiotherapy and the 883 authorizations for coronary artery bypass procedures by 355% and 986%, respectively [9].

Service utilisation patterns for patients receiving care at the only provider of IVF in Luxembourg are shown in Table 2. A 44% increase in pregnancy rate was noted from 2005 to 2006 (32 vs. 46 clinical pregnancies), and a 70% increase was observed from 2006 to 2007 (46 vs. 78 clinical pregnancies).

Discussion

These data highlight women's acceptance of IVF treatment in Luxembourg, and indicate how proximity and convenience can impact the provision of the assisted reproductive technologies. Substantial public funding was required to establish fertility services in Luxembourg, and

these findings regarding public utilisation of more locally available ART services is noteworthy. The literature on reliance on foreign competencies for specialist care in reproductive medicine is limited, and we are unaware of government datasets describing the number of individuals leaving a given jurisdiction specifically due to lack of nearby services, and how that may change once they become locally available. To study this, the Luxembourg Social Security System was used to capture all reimbursed foreign care authorizations. Stated another way, since results of internal governmental analyses are not typically placed in the public domain, the present investigation offers an unusual opportunity to characterise consumption of fertility services as a function of service site. In terms of access to care, the number of IVF cycles undertaken by Luxembourg patients in 2004 was comparable to other European reference groups (see Table 3). However, because neither live birth rates per cycle of treatment nor overall multiple birth rate could be reliably calculated, it was impossible to make international comparisons beyond access to care.

Our study was limited by a relatively short sampling time and a specific geographic focus. Patients obtaining IVF treatment outside of Luxembourg might have selected a foreign clinic for personal reasons, irrespective of the service being provided locally. In addition, travel to a foreign location for IVF could have some non-reimbursed associated expenses that could add to the stress of the infertility experience. Obtaining IVF at a domestic unit likely was accompanied by reduced anxiety, but this was not directly measured in this investigation. It should be noted that our study identified a small proportion (< 5%)

of patients having IVF in Luxembourg who originated from locations outside the Grand Duchy.

At the same time, our analysis is strengthened by its inclusion of a statistically homogeneous population sample (>95% from Luxembourg) who underwent IVF procedures during a defined period. Although very few countries reimburse patients for 100% of IVF cost, none to our knowledge besides Luxembourg are able to stratify healthcare disbursements by specific medical procedures obtained abroad. Finally, the advantage of entering the world fertility stage late in the game, as was the case in Luxembourg, could only provide the local physicians with the benefits of an extensive literature.

Future directions and conclusions

The demographics of childlessness and patterns of medical care utilization have changed rapidly since assisted reproduction first appeared as a viable option in England in 1978. In Luxembourg, the numbers of women who received authorization to undertake ART at a foreign clinic declined markedly after 2005. As other specialist care facilities continue to expand within Luxembourg, it is reasonable to suppose that further changes will occur in the need to travel abroad for medical care. Increasing availability of domestic specialist care will clearly affect the return on the sizable recent investments in clinical facilities, as well as decrease the external efflux of public funds to foreign clinics. Whereas Luxembourg has one of the largest per capita to GDP ratios of healthcare investment in the world [10], this figure is undoubtedly influenced by recent capital expenditures to improve services that will be amortized with time. The observed increase in domestic utilization in the present specialty highlights the likely human capital and wider economic returns on these investments.

One of the additional advantages of conducting public health research in Luxembourg is that data tend to be comprehensive, population-based and used to form the basis of a national comparison. Over the next few years, the Government of Luxembourg plans to deploy a new Birth-related Health-monitoring System (SUSANA) to

monitor mothers' and babies' health outcomes over time, and implement preventative measures based on the results of specific interventions. Interlocking results from the SUSANA dataset with the research methodology described here (focusing specifically on ART services) represents the focus of future studies.

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