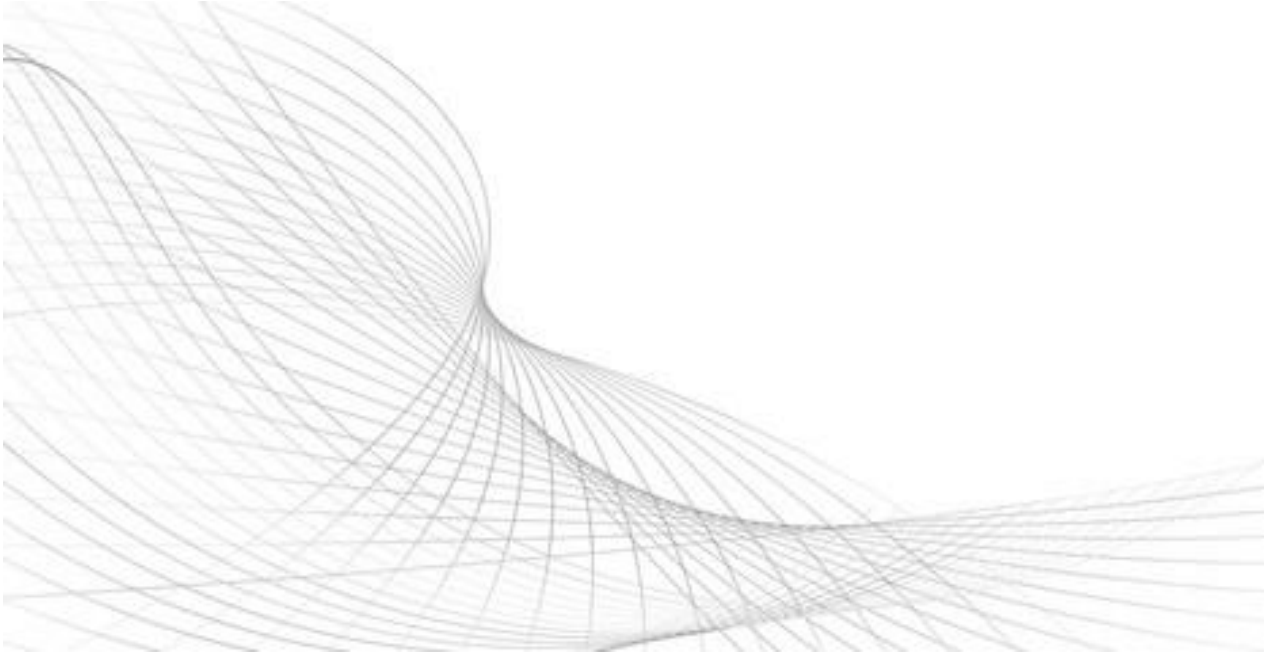
European Training Network
“Improving Quality of Care”

FINAL RESULTS REPORT
2017-2020



Contents

EXECUTIVE SUMMARY

European Training Network – Improving Quality of Care in Europe "IQCE" 2017-2020

Six European universities

- University of Hamburg, Hamburg Center for Health Economics (HCHE), coordinator
- Erasmus University Rotterdam, Erasmus School of Health Policy & Management (ESHPM)
- Bocconi University, Centre for Research on Health and Social Care Management (CERGAS)
- Universidade Nova de Lisboa, Nova School of Business and Economics (NOVA SBE)
- University of Southern Denmark, Danish Centre for Health Economics (DACHE)
- University of York, Centre for Health Economics York (CHE)

and the multinational health care company Abbott have established a European Training Network titled Improving Quality of Care in Europe (IQCE).

A European Training Network (ETN) is a consortium funded by the EU program Marie Skłodowska-Curie Actions (MSCA) that sets up joint research and training programs for researchers at the doctoral level. The IQCE program aimed to improve the quality and performance of European health care systems. Fifteen early-stage researchers (ESRs) from eleven countries were trained to be experts in the field of quality of care and conducted research on one of six dimensions of health care quality as defined by the World Health Organization (WHO): effectiveness, safety, efficiency, access, equitability, and acceptability. The scientific evidence created in the 63 research papers was broadly disseminated and exploited through variegated channels contributing to the improvement and shaping of national and European health care policies and systems.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

LIST OF TABLES

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

LIST OF ABBREVIATIONS

CERGAS - Centre for Research on Health and Social Care Management

CESAV - Valenti Centre for Health Economics

CHE - Centre for Health Economics York

COVID-19 - Coronavirus Disease 2019

DaCHE - Danish Centre for Health Economics

DoHSC UK - Department of Health and Social Care United Kingdom

ECOS - European Covid Survey

ESHPM - Erasmus School of Health Policy & Management

ESR - Early Stage Researchers

ETN - European Training Network

HCHE - Hamburg Center for Health Economics

IQCE - Improving Quality of Care in Europe

MSCA - Marie Skłodowska-Curie Actions

NHS I - National Health Service Italy

NHS P - National Health Service Portugal

NOVA SBE - Nova School for Business and Economics

RP - Research Paper

RUGP - Research Unit of General Practice, Odense University Hospital

TK - Techniker Krankenkasse

UKE - University Medical Center Hamburg-Eppendorf

WHO - World Health Organization

WP - Work Package

ZINL - National Health Care Institute Netherlands

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

1. OVERALL PROJECT OBJECTIVES

1.1 Introduction

Quality of care may be defined as an improvement in health in relation to the best possible outcome that could have been achieved if current medical knowledge is applied. Although improving quality of care is of utmost importance for European health care systems, previous research provides too little evidence of areas that lack quality of care, causes of low quality, and instruments to improve the quality of care. However, health economics as a discipline has excellent instruments and methods to substantially generate evidence in the field of quality of care. Thus, the IQCE research program focused on health economics research to "Improve the Quality of Care in Europe."

The program had the following objectives: 1) create new evidence and improve existing health economics research in the field of quality of care; 2) establish a close link from topical PhD projects to health policy and practice, ensuring high relevance and practical applicability of the results; 3) train ESRs to be experts in the field of quality of care and obtain excellent profiles for variegated career paths in health economics research or practice; 4) contribute to better coordination of currently fragmented health economics research in Europe; and 5) serve as a model for joint doctorate programs in health economics in Europe.

The research program was structured around dimensions of quality of care defined by the World Health Organization (WHO). The close connection between the PhD topics and the WHO dimensions ensured that the research was rooted in practical need. According to the WHO, quality of care has six dimensions that need to be improved: (a) effectiveness, that is, delivering health care to ensure that it adheres to an evidence base and results in improved health outcomes for individuals and communities based on need;

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

(b) efficiency, that is, delivering health care in a competitive or regulatory framework that optimizes resource use and avoids waste;
(c) access, that is, delivering health care that is timely, geographically reasonable, and provided in a setting in which skills and resources are appropriate to medical needs;
(d) acceptability to the patient, that is, delivering health care that considers the preferences and aspirations of individual service users and the cultures of their communities;
(e) equitability, that is, delivering health care that does not vary in quality because of personal characteristics such as gender, race, ethnicity, geographical location, or socioeconomic status; and
(f) safety, that is, delivering health care that minimizes risks and harm to service users.
Based on these six dimensions, we defined research clusters for the PhD topics. To increase distinctness, we merged effectiveness (a) and safety (f) as well as access (c) and equitability (e) into one cluster each. Thus, we defined four research clusters in our ETN: “Effectiveness and safety,” “Efficiency,” “Access and equitability,” and “Acceptability.”
Across the WHO dimensions or clusters, scientific training courses, employability training, and research-in-progress workshops ensured cooperation and interaction between all early-stage researchers (ESRs) in the program.
The final year of the ETN program was affected by the COVID-19 pandemic. However, we took the pandemic as an opportunity to conduct research on it with the methods of health economics: a pan-European project studying COVID-19 has been initiated by supervisors and ESRs from CERGAS, NOVA SBE, ESHPM, and HCHE. In the European Covid Survey (ECOS), topics such as the impact of the pandemic on the demand side of health care, including people’s mental health, approval of containment policies, acceptability of a vaccination against COVID-19, and foregone care, were investigated.

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

In the following pages, we describe the objectives and results achieved in the program following the structure of the work packages initially defined in the project.

1.2 Objective "Creation of the new evidence"

The IQCE research program was structured around dimensions of quality of care in four research clusters: "Effectiveness and safety," "Efficiency," "Access and equitability" and "Acceptability." The clusters provided orientation for ESRs and simultaneously narrowed the research gaps and needs for each cluster. The research conducted in the ETN program created new evidence in the quality of care field and substantially added value over existing research in each of the four clusters. In the following, we introduce the overall topic of each research cluster, and the clusters' research projects are described in detail in Chapters 2.2.-2.5 WP 2-WP 5.

Research cluster "Effectiveness and safety" with the following PhD topics

PhD 1: Improving quality of care by increasing adherence to treatment

PhD 2: Identifying and improving quality of care and patient safety in hospitals

PhD 3: Improving quality of care by managing the availability of blood and blood products

PhD 4: Exploiting administrative databases to improve evidence

Previous research in this field has modeled interactions between physicians/organizations and patients and their effects on outcomes or safety parameters to identify evidence-based guidelines for decision making. However, drawing inferences on the behavior between physicians/organizations and patients requires a combination of health economics (modeling behavior of individuals and organizations) and health services research (modeling outcomes), which is often

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

disregarded in these studies. The PhD projects in this cluster addressed both limitations of previous studies. In this cluster, ESRs investigated the interaction between providers and patients using exclusively opened population-wide patient records from real-life settings in many European countries. They used innovative econometric methods, such as synthetic control groups. Topics of the 6 published papers, 5 submitted research papers, and 6 working papers range from regimen simplification and medication adherence, the influence of the clinical environment on physicians' treatment choices, and blood donation behavior to the impact of an economic crisis on mental health care. A comprehensive description of the research projects carried out in this cluster is provided in Chapter 2.2 WP 2 Research cluster "Effectiveness and safety."

Research cluster "Efficiency" with the following PhD topics

PhD 5: Do pay-for-performance and public reporting impact quality of care?

PhD 6: Competition and quality of care in primary care

PhD 7: Price of hospital care and its impact on quality of care

PhD 8: Improving efficiency of care using medical technology/devices

There is a long tradition in health economics to theoretically or empirically model regulatory regimes in health care markets and investigate their effects on welfare, consumer behavior, prices, volumes, and other aspects. However, studies on the impact of different regulatory regimes or interventions on health outcomes are rather scarce. In particular, price regulation increasingly plays an important role in health care markets. Every European country has introduced several price regulation schemes. Although numerous natural experiments of changes in price regulations exist, very few studies exist on the effects of price regulations on health outcomes. The available studies on this relationship show that changes in regulation, such as the introduction of yardstick competition in hospital care, can have important effects on health

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

outcomes. The PhD topics in this cluster addressed the research gaps of previous research and investigated incentives from regulations and their effects on health outcomes. The topics of the 1 published paper, 2 submitted research papers, and 7 working papers range from the evaluation of an electronic health record system and health care costs for Danish diabetes patients, the efficiency of primary care management, and the effects of hospital competition on quality of care to the impact of guidelines on the diffusion of medical technology. A comprehensive description of all research projects carried out in this cluster is provided in Chapter 2.3 WP 3 Research cluster "Efficiency."

Research cluster "Access and Equitability"

PhD 9: The effect of hospital volume on quality of care

PhD 10: Comparing quality of care across health care systems

PhD 11: Does inequity in access to secondary care impact quality of care?

One of the most important challenges of the health care system is to provide care of equal quality to everyone regardless of age, sex, ethnicity, income, geographic location, or any other demographic detail. Several theoretical approaches exist to model incentives and differences in access to care. From an empirical point of view, differences in access to care seem to exist. However, evidence for the causes of the inequities in access and the implications of the inequities on outcomes is largely lacking. Studies are often methodologically inadequate, limiting the scope for appropriate policy recommendations. Two of the presented PhD topics addressed this research gap by investigating differences in access to hospital and specialist care and their implications for health outcomes. One PhD project developed a quality index facilitating equal information levels and access to care. The topics of the 5 submitted research papers and 5 working papers range from the impact of hospital volumes on

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

health outcomes and the development of the quality health care index across European health care systems to investigations variations in the treatment behavior of Danish general practitioners (GPs). A comprehensive description of all research projects carried out in this cluster is provided in Chapter 2.4, WP 4 Research cluster "Access and equitability."

Research cluster "Acceptability"

PhD 12: Societal value of health and well-being gains

PhD 13: Economic shocks, subjective well-being, and adaption

PhD 14: Impact of economic crisis on health, quality of care, and demand

PhD 15: The formation of reference points in decision making

Investigating individual or societal preferences in health care and health care delivery is a growing field in health economics. Medical/technological progress in situations of tight budgets increasingly requires health policy makers in Europe to find societally accepted rules for allocation decisions. Although research on (stated) preferences in health economics, such as discrete choice experiments, has become an established instrument to guide health policy decisions, methodological improvements and incorporation into a decision-making framework remain important research areas. Two PhD projects in this cluster developed and improved methods to measure societal preferences for allocation decisions. Moreover, allocation decisions in health care delivery against the preferences of individuals or societies, such as austerity measures in financial crises, are highly prevalent in many European countries. Thus, two PhD projects focused on the effects of allocation decisions during the financial crisis in Portugal and Italy and their effects on health outcomes and have taken up the COVID-19 crisis in their research. The topics of the 6 published papers, 5 submitted research papers, and 11 working papers range from the estimation of the monetary value of

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

health, the impact of hospital closures on acute myocardial infarction (AMI) patients, the impact of adverse economic conditions on geriatric patients, and the role of domain-specific reference points in life satisfaction. A comprehensive description of all research projects carried out in this cluster is provided in Chapter 2.5 WP 5 Research cluster “Acceptability.”

1.3 Objective “Practical applicability of results”

Industrial supervisors, secondments, and participation of partner organizations in research-in-progress workshops ensured a close link of the PhD projects to health policy and practice and employability after the program. A close exchange of health care practices and policies was guaranteed through close cooperation with practice partners attributable to the following.

- **Industrial supervision:** Each ESR had an industrial supervisor, that is, a mentor from the health economics practice. The mentor (a) guided the ESRs on how to translate results into health policy or apply them in industry, (b) hosted the ESR in a secondment, (c) ensured that career development proceeds in a way that the employability of ESR in the industry is improved by the program by contributing to the ESR´s career development plan, and (d) contributed to research-in-progress workshops by commenting on the ESR´s work.
- **Industrial secondments** in which each ESR interned at one of our industrial partners gave the ESRs the opportunity to investigate different career choices and extend the possibilities of developing a research infrastructure. The industrial secondments strengthened the transfer of research into practice. For example, the results from the research project of ESR 3 showed the German university hospital (UKE) blood donation service that their decline in donation levels was

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

driven by repeat donors donating less regularly or being lost completely rather than a decline in first-time donors. This result informed the UKE's donor management policy and encouraged them to focus on the return of existing donors rather than on new donors. Among others, ESRs completed industrial secondments at National Health Services Italy and Portugal, the National Health Care Institute Netherlands (ZINL), Odense University Hospital, and a pharmaceutical company (Novo Nordisk). Please find more information on secondments in Chapter 2.6 "Training."

- **Provision of date/joint collection of data:** Every ESR closely interacted with at least one industrial partner in their research projects in the provision or the joint collection of data. In total, the ESRs used data from 21 different sources, including National Health Service (NHS) Italy, Portugal, and the United Kingdom, and data from large hospitals (UKE, Ospedale Niguarda ca' Granda), and sickness funds (Barmer GEK and Techniker Krankenkasse (TK)). Please find detailed information on the datasets used in Chapters 2.2-2.5 on WP 2-WP 5.
- **Research on COVID-19 with high practical relevance:** One of the main goals of the ETN was to make a difference through our research: we were committed to impact, public engagement, and knowledge mobilization. The pandemic led to the mobilization of our expertise and enhanced network cooperation: a research team consisting of supervisors and ESRs from CERGAS, NOVA SBE, ESHPM, and HCHE initiated the ECOS in February 2020. Research projects investigating different aspects and impacts of the pandemic in Europe were highly topical, and the participating ESRs were invited to different events, such as the Mercator Foundation Roundtable 2020, to communicate project results to policy makers and the general public. Please find more information on this project in Chapter 2.5 WP 5 Research cluster "Acceptability."

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

1.4 Objective "Train ESRs to be experts in the field of quality of care"

To achieve this objective, we composed the ETN training program that consisted of the following innovative aspects: 1) a comprehensive multidisciplinary course program with a broad choice of topical research-related courses in health economics taught by European-wide specialists in the field, 2) mandatory employability training courses tailored for different stages of the PhD that equip transferable competences and complementary employability skills, 3) active career planning, including regular sessions with professional career counselors, and explicitly providing training to qualify for different career paths, and 4) in addition to excellent research training, a strong link to health policy and practice through the involvement of private sector participants in courses and workshops, as well as through secondments and joint supervision.
In total, 24 courses, 4 core electives, 6 core electives, 6 specialization courses, and 8 soft skill courses took place.
The ESRs were trained to critically reflect and discuss topics in a multidisciplinary context with professionals with backgrounds in medical science, health sciences, epidemiology, economics, and other relevant disciplines. During the ETN program, ESRs were already able to act as experts for academia and practice, confirming the high standard of ETN training. For example, ESR 15 gave a presentation about the health economics view of quality in health care for the Medical Chamber Schleswig-Holstein and conducted a workshop there as part of the quality management training. ESR 8 served as a member of the European Health Parliament Committee "Data for Healthy Societies" (an initiative by multiple health care stakeholders in Brussels). During 2018-2019, ESR 8 developed and disseminated policy recommendations to the EU commission for health care data-related policies from 360-degree perspectives focusing on health care systems/providers, policy makers, and patients. The excellent

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

quality of the ETN training program was also confirmed by the fact that four ESRs received attractive job offers in the last months of the program: two of the ESRs as postdoc researchers at their host institutions, and two others filled job positions at the national Ministries of Health. Please find more detailed information on the ETN teaching program in Chapter 2.6 WP 6 "Training."

1.5 Objective "Better coordination of currently fragmented health economics research in Europe"

In Europe, health economics research is fragmented across Europe, and centers for health economics research often lack critical mass relative to those in the United States. Better European-wide coordination of health economics research, also through joint training programs and pooling of resources, is needed to increase the competitive position of European health economics research and enable European research centers to catch up with the best research centers in the United States. Thus, the goal of the IQCE program was to contribute to the consolidation of European health economics research by the following means.

- **Interinstitutional cooperation:** The academic secondments gave the ESRs the opportunity to work closely with colleagues from different partner organizations. To enable a closer exchange of ideas among ESRs in the same research cluster, academic secondments were primarily organized in each cluster. Cooperation among ESRs among theoretical, empirical, and experimental researchers in research clusters led to innovative combinations of different methodological approaches. Thus, given the cooperation in the research cluster "Acceptability," it was possible to start the ECOS that combined the specific health economics expertise of each institution and the local knowledge, such as survey design expertise from ESHPM, the experience of conducting online experiments from

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

CERGAS, economic modeling from NOVA SBE, and policy experience from HCHE. The findings of the ECOS project are presented in 8 joint research papers. The ECOS project allowed ESRs to work closely with seniors from several universities and generate valuable project management experiences, pan-European science cooperation, and grant applications while also building a closer research network among the involved scientists. The research team is currently applying for further funding to extend the project beyond the ETN.

- **Joint supervision:** Joint supervision was implemented for all fellows. Whereas the primary supervisor will be at the host institution, the person who hosts the first secondment of the ESR will act as the ESR's secondary supervisor throughout the duration of the program. This ensures optimal support in achieving scientific progress and meeting educational goals. In doing so, the lead supervisors stay in permanent exchange, closely cooperate on gaining access to data, and regularly participate in scientific conferences.
- **Close interaction of the beneficiaries:** The beneficiaries worked closely together and consulted on overall network issues through frequent telephone conferences and, as often as possible, at personal meetings. Beneficiaries were also actively involved in teaching activities: each beneficiary offered two training courses and hosted the ESRs at least once during the PhD training program. Frequent bilateral communication also occurred among beneficiaries, such as on the organization of mutual secondments. During regular research-in-progress workshops—at which the ESRs presented on their progress—incorporated in the ETN program on a regular basis, partners provided comprehensive feedback on the research progress of the ESRs.
- **Communication and dissemination of the program:** The effective communication and dissemination of the ETN program contributed to health economics being perceived as an important scientific field. The increased presence and visibility of

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

health economics has the potential to alter prioritization in universities and research institutions and, thereby, facilitate the creation of new positions and better equipped departments for health economics in the future.

1.6 Objective "Model for joint doctorate programs in health economics in Europe"

- **Organizational learning**: Through participation in the IQCE program, larger health economics centers gained new experiences, accumulated new knowledge, and learned about possibilities for joint doctorate programs in health economics. By the end of the program, the experiences from the project can serve as a model for joint doctorate programs in health economics. Strong international collaboration in the program can be used in the future as a signpost for the Cotutelle de thèse procedure.
- **Increased visibility:** Because of the active and continuous project communication, we aimed to maximize the benefits of the program through increased visibility. The program's communication served as an important signal that health economics is perceived as an important scientific field. The European Health Economics Association (EuHEA), as a partner of the ETN, supported the communication of the ETN program and helped to communicate the diffusion of the concept at conferences and events. The ETN program enjoyed a strong reputation that potentially increased the employability of ESRs.
- **Joint Doctoral Degrees**: At the moment, the beneficiaries from Rotterdam (ESHPM), Odense (DaCHE), and Hamburg (HCHE) are working on a joint doctoral degree program with the intention of allowing for permanent cooperation in training PhDs and allowing for double degrees. This program may also lead to an EJD proposal or be applicable under the predecessor of Horizon 2020.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

2. WORK PACKAGE OBJECTIVES

2.1. WP 1 Management

The ETN project was of strategic importance to the network's beneficiaries. The ETN project management team aimed to ensure that the project was completed as expected and that the projects' strategic objectives were realized. The general financial management strategy of the network aimed to achieve project objectives with given financial resources to maximize its value. Because of the COVID-19 prevention measures, the management team and the beneficiaries were obliged to change their work plans and activities, which had consequences on the overall project implementation in the last project year. In the following, please find the overview of management activities carried out during the 2017-2020 network.

The clusters' objectives achieved are as follows:

In the ETN, we divided responsibilities into central and local levels. At the central level, managing decisions for the ETN were done jointly by an executive board—the so-called Scientific Coordination Committee. The Scientific Coordination Committee was headed by the Scientific Coordinator, Professor Schreyögg from HCHE, who acted as the Scientist-in-Charge for the European Commission. The activities of the Scientific Coordination Committee were supervised and advised by a supervisory board that consisted of 20 members to ensure a broad multidisciplinary background, including the scientist-in-charge of each participating beneficiary and an ESR representative elected by all ESRs.

The management of the ETN was conducted by HCHE in Hamburg. A program manager operating at the central level oversaw and coordinated all program activities. Furthermore, the program administrative manager monitored the program's progress, prepared the Scientific Coordination Committee meetings, and ensured that

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

information flowed to the Supervisory Board. A program manager was also in regular contact with the EU Project Officer, who reported the program's progress and incorporated her feedback into the daily work. Furthermore, to showcase the work done in the project, the IQCE management team steered and coordinated the activities to disseminate and exploit the results among the beneficiaries.

Overview of the main activities of program management (2017-2020)

- The project's consortium agreement that included all management and financial aspects of the consortium and the project's implementation was signed on January 1, 2017. The kick-off meeting for the Scientific Coordination Committee occurred on January 31, 2017. Then, the foundations of recruitment, communication strategies, and training program were developed.
- WP management also included recruiting ESRs through multinational advertising for the 15 PhD positions. As a recruiting strategy, the ETN consortium committed itself to the principles and requirements of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. The beneficiaries completed the recruitment process by the end of 2017. Fifteen ESRs were recruited from 11 countries (54.5% from EU countries), 60% of whom were female:

ESR NR.	PhD topic	Host
ESR 1	Improving quality of care by increasing adherence to treatment	HCHE
ESR 2	Identifying and improving quality of care and patient safety in hospitals	CHE
ESR 3	Improving quality of care by managing availability of blood and blood products	HCHE
ESR 4	Exploiting administrative databases to improve evidence	CERGAS
ESR 5	Do pay-for-performance and public reporting impact quality of care?	DACHE
ESR 6	Competition and quality of care in primary care	NOVA SBE

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

ESR 7	Hospital care price and its impact on quality of care	HCHE
ESR 8	Improving efficiency of care using medical technology	Abbott
ESR 9	Effect of hospital volume on quality of care	CHE
ESR 10	Comparing quality of care across health care systems	HCHE
ESR 11	Inequality in access to secondary care in Denmark	DACHE
ESR 12	Societal value of health and gains in well-being	ESHPM
ESR 13	Economic shocks, subjective well-being, and adaption	CERGAS
ESR 14	Impact of economic crisis on health, quality of care, and demand	NOVA SBE
ESR 15	Formation of reference points in decision making	ESHPM

Table 1: PhD topics

- At the beginning of 2018, the individual career development plans for ESRs were developed and approved by the Scientific Coordination Committee. Using the career plans, the IQCE management team developed an individual course program for each ESR to allow for training according to each ESR's needs and to facilitate travel arrangements. Courses and workshops were managed throughout the entire program by the ETN management team in Hamburg.
- The mid-term review with the EU project officer of the ETN occurred on November 6, 2018, in Hamburg. After the meeting, we integrated the feedback into and adopted the recommendations for the management, dissemination, and research activities of the network. In particular, we extended the circulation of the training program materials through our external communication channels and enhanced our training evaluation activities.
- The annual scientific coordination committee workshops and the interim additional telephone conferences were used to discuss and develop the project management plans, research, training, and dissemination activities of the network. The workshops took place in 2017 in Hamburg, in 2018 in Rotterdam, and in 2019 in Odense. The Special Scientific Coordination Committee workshop at the end of the program was planned to take place in Milan in 2020. Because COVID-19

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

regulations restricted travel, the workshop was held as a video conference on April 22, 2020.

- The supervisory board's final results workshop was planned to take place in Hamburg to give network members the opportunity to reflect on the experiences and to exchange information in person. However, the workshop was held as a webinar because of COVID-19 regulations. The workshop records are available on the ETN website: www.iqce.uni-hamburg.de/dissemination/final-results-workshop-2020.html. Please find more information on the final results workshop in Chapter 2.7 "Dissemination."

2.2. WP 2 Research cluster "Effectiveness and Safety"

PhD 1: Improving quality of care by increasing adherence to treatment
PhD 2: Identifying and improving quality of care and patient safety in hospitals
PhD 3: Improving quality of care by managing the availability of blood and blood products
PhD 4: Exploiting administrative databases to improve evidence

The clusters' objectives achieved are as follows:

In the first phase of the ETN, all ESRs participating in WP 2 performed comprehensive reviews for their respective PhD topics. The reviews were used as the basis for the definition of the analytic models and data needs for empirical papers or were included in stand-alone review papers. In the second phase, all ESRs obtained and prepared data from, among others, our cooperation partners (Table 2) and developed appropriate econometric models for their research questions. In the final phase of the ETN, the ESRs interpreted their findings, drew out implications, and presented their results in scientific publications and at international conferences. In total, 17 research papers

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

(RPs) were written in the research cluster "Effectiveness and Safety." In the following, please find an overview of RPs carried out in WP 2 from each ESR.

The datasets in WP 2 that the ESRs have exploited are as follows:

ESR Nr.	Dataset
ESR 1	Hospital and outpatient data from Techniker Krankenkasse (TK) (German sickness fund); IQVIA data; data from the Cornerstones for Care® powered by the Glooko app (mHealth for diabetes)
ESR 2	Hospital Episode Statistics (HES) from NHS Digital; publications of Clinical Excellence Awards from the Advisory Committee on Clinical Excellence Awards (ACCEA)
ESR 3	Blood donations and administrative data from the University Medical Center Hamburg-Eppendorf, blood donation data from the Austrian Red Cross
ESR 4	Hospital discharge dataset of elderly patients from the Italian NHS, psychiatric department discharge dataset from Ospedale Niguarda ca' Granda; Italian Hospital Discharge Data (SDO) from the Ministry of Health; hospital capacity data from Ministry of Health; municipality income data from ISTAT

Table 2: Datasets in WP 2

ESR 1: Improving Quality of Care by Increasing Adherence to Treatment. Research papers

2017-2020

RP 1: In the first research paper, "Regimen simplification and medication adherence: Fixed-dose versus loose-dose combination therapy for type 2 diabetes," ESR 1 conducted research on the impact of the mode of drug administration on adherence. To measure the degree to which differences in adherence and costs are driven by causal effects of the mode of drug administration, ESR 1 made use of patient-level administrative data and applied a two-stage risk adjustment combining entropy balancing with a difference-in-difference (DiD) regression. The results of the first study suggest that fixed-dose combination (FDC) therapy yielded significant improvements in medication adherence rates and persistence compared with a two-pill regimen. The impact of FDC on adherence is strongest in poorly adherent patients, patients with a

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

high pill burden (polypharmacy), and patients who did not have a severe concomitant disease. The results do not show any effect on health outcomes and therapeutic safety. *Böhm, A., Schneider, U., Aberle, J., & Stargardt, T. Regimen simplification and medication adherence: Fixed-dose* versus *loose-dose combination therapy for type 2 diabetes. [Manuscript submitted for publication].*

RP 2: The second study, "The economics of fixed-dose combinations for diabetes," builds on the first study, which found that simplifying the drug regimen through FDCs significantly increases medication adherence. The second study sought to obtain a more comprehensive picture of the effectiveness of combination products and aimed to investigate these products' effects on economic outcomes. Although an increase in medication adherence may increase short-term pharmaceutical spending, these costs may be offset by improved long-term health outcomes. Additionally, copayments may be affected. A population-based cohort was evaluated using administrative data to achieve the study's aims. DiD estimators were calculated to account for time-invariant unobservable heterogeneity after removing dissimilarities in observable characteristics between the FDC and the loose-dose combination group using entropy balancing. The results show that although FDC therapy results in higher diabetes-related pharmaceutical spending, no significant differences were found with respect to all-cause pharmaceutical costs, in- and outpatient spending, or total health care costs from the payer's perspective. However, from the patients' perspective, FDC treatment may be the preferred treatment choice because of significant savings in copayments. The working paper is as follows:
Böhm, A., Schneider, U., & Stargardt, T. The economics of fixed-dose combinations for diabetes: Does mode of drug administration impact health care spending?

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 3: The third and fourth papers were written during the secondment of ESR 1 and in collaboration with Novo Nordisk A/S. The third paper aims to analyze how intensively diabetes patients engage with mobile health (mHealth) and to identify the user characteristics associated with engagement with mHealth. Such apps may increase users' health literacy, support patients in playing a more active role in managing their disease and promote adherence to treatment. The analysis is based on real-world data obtained by Novo Nordisk's Cornerstones4Care® diabetes support app. Beta regressions were estimated to assess associations between user characteristics and engagement outcomes for each module of the app. The results suggest that most users (55%) took advantage of one specific module of the app. User engagement (i.e., adherence to mHealth) was higher for modules with automated data collection, although initial uptake remained lower for these modules. Therefore, to increase the use of apps, providers of mHealth should consider the data gathering and content design mode but take into account users' privacy concerns. Users' engagement was determined by various patient characteristics: although most users reported being female, male users engaged significantly more with the app. Older people and recently diagnosed users tended to more actively use the app, indicating that particular patient groups should be specifically targeted or assisted when integrating apps into the self-management of their disease.

Böhm, A., Jensen, M.L., Sørensen, M.R., & Stargardt, T. (2020). Real-World Evidence of User Engagement with Mobile Health for Diabetes Management: Longitudinal Observational Study. JMIR mHealth and uHealth, 8(11), e22212.

RP 4: The fourth study is also based on diabetes patients' blood glucose data obtained from Cornerstones4Care® powered by the Glooko app. An expert panel reached consensus on clinical targets for continuous glucose monitoring (CGM) data interpretation on the basis of eight metrics. At least 70% of 14 consecutive CGM days

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

are recommended to assess glycemic control using the metrics. However, in clinical practice, less CGM data may be available, such as through nonadherence to medical advice or sensor error. Therefore, this study aimed to explore how well consensus metrics can be recovered when fewer CGM data are available by calculating the relative absolute difference between both data inputs. The results show substantial differences when recovering consensus metrics and glycemic control outcomes using fewer than 14 days of data. Furthermore, two consecutive 14-day periods do not necessarily lead to the same glycemic control outcome.

Böhm, A., Mohebbi, A., Tarp, J., Jensen, M., Bengtsson, H., & Morup, M. (2020). Early glycemic control assessment based on consensus CGM metrics. [Manuscript submitted for publication].

RP 5: The last paper of ESR 1 focuses on competition in off-patent biologic drug markets. Although the introduction of advanced medical products, such as biologics, offers new opportunities for preventing and treating many diseases, their high cost raises concerns about the affordability of health care systems for patients. During recent decades, the first expensive biologic medicines began to lose their patent protection, offering biosimilars the possibility of entering the market. However, in contrast to generics, biosimilars are not exact copies of the innovator, and automatic substitution remains restricted. Therefore, it is unclear whether and to what degree biosimilars can serve as cost-containment tools such as generics. This study aimed to analyze the effect of biosimilar competition on market diffusion and prices among 25 European countries using IQVIA data on revenues and units sold of all biologics from 2014 to 2020. To evaluate the effect of biosimilar competition on market outcomes, mixed generalized linear models (GLMs) including substance and country fixed effects are estimated. The results indicate that the market share of biosimilars is increasing

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

over time and that competition causes lower substance prices; however, compared with the existing literature on generics, the effect is smaller.

The title of the working paper is:

Böhm, A., Steiner, I., & Stargardt, T. Competition in off-patent biologic drug markets: A European comparison of competition induced price trends and market diffusion.

ESR 2: Identifying and improving quality of care and patient safety in hospitals. Research papers 2017-2020

RP 1: To improve the quality of care and safety of patients in hospitals, tackling variations in medical care is paramount. By now, such variations clearly cannot be simply explained by differences among patients. However, the role of provider characteristics, such as the clinical environment and doctors' preferences and beliefs, remains unclear. The first research paper in PhD topic 2 examines how surgeons' practice environment drives their treatment decisions between cemented and cementless hip replacements, two common fixation methods in this surgical procedure. The study uses patient-level administrative data from all publicly funded hip replacement surgeries in England between 2008 and 2016 to construct surgeons' employment histories and identify surgeons who move their practice across hospitals during the study period. The exogenous shock in the practice environment provided by the move is then used to estimate the impact of the environment on surgeons' treatment style using a DiD design. After the move, surgeons' treatment choice changes by an average of 6.4 percentage points for each 10-percentage point change in the practice environment. This finding suggests that the environment wherein surgeons practice matters for their treatment choices. The study also shows that surgeons adapt quickly after the move, without any further adjustments to the new environment over time. Most importantly, the change in practice style has no negative

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

effects on the quality of care. Finally, the study found no evidence of the selection of surgeons in hospitals, which could be driving the findings.
The title of the working paper is:
Fernandes, L., Chalkley, M., & Gutacker, N. The influence of the clinical environment on physicians' treatment choices.

RP 2: Health care policy makers are increasingly adopting pay-for-performance programs in an attempt to curb costs and reduce inefficiencies in health care. One such example is the UK's Clinical Excellence Awards (CEA) scheme, which provides financial awards for doctors who demonstrate high standards of performance and commitment to the English NHS. Economists have long suggested that when more than one task is expected of a worker, as is the case with doctors, selective payment may give rise to unanticipated and dysfunctional behavior. In this incentive problem, known as multitasking, workers direct their attention toward activities that are explicitly rewarded and away from those that are not. The research paper assesses whether doctors pursuing CEA neglect their clinical responsibilities, which are not incentivized by the scheme. A unique and rich dataset is used that includes doctor-level panel information on NHS inpatient activity, award holders, and doctor characteristics for 2009 to 2015. Doctor activity is measured using the annual count number of finished episodes of care per doctor, where a single episode is defined as a period of health care under one doctor in one hospital provider. The study proposes a novel weighting procedure for doctor activity, which is based on patient episode length of stay, to reflect the effort and time required by doctors with different patients. The overall sample included 149,795 doctor-years, corresponding to 27,021 doctors. Taken together, the results show that awards are poorly associated with changes in doctor activity. This finding suggests that doctors do not inevitably shirk their clinical practice when incomplete contracts are specified.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

The title of the working paper is:

Fernandes, L., Chalkley, M., & Gutacker, N. Time to Reform? The Effect of Winning Financial Awards on Consultant Activity in the English NHS.

RP 3: Little evidence exists on how doctors respond to changes in pay. Because doctors have a unique role in leading clinical care processes, information on whether pay can influence their labor supply decisions is important in helping to design policies to improve the productivity of health care organizations and the quality of care provided. This study exploits an exogenous change in the UK pension tax system to examine the effect of pay on the activity rates of doctors working in the English NHS. In 2016, the UK government reduced the amount of annual pension savings that benefit from tax relief for high-income individuals. If an individual's annual pension contributions surpass the defined thresholds, a tax charge at their marginal income rate applies to the excess, effectively reducing an individual's take-home pay. Following the existing literature, this article expects that i) some doctors affected by the pension tax might reduce activity, particularly by avoiding additional work, whereas ii) others may be pushed to early retirement or leave the NHS. This study uses a rich doctor-level panel with individual information on NHS activity and doctor characteristics from 2014 to 2018, and a difference-in-differences design to estimate the effect of a change in pension on doctor activity rates. The findings show that the change in pension rules may have led to reductions in the activity rates of consultants affected by the policy.

The title of the working paper is:

Fernandes, L., Chalkley, M., & Gutacker, N. 'Beg, Bargain and Borrow' – The Effect of Tapering Pension Earnings on Consultant Activity Rates in the English NHS.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

ESR 3: Improving quality of care by managing the availability of blood and blood products. Research papers 2017-2020

RP 1: In the first study, "Blood donation and donors: insights from a large German teaching hospital (2008-2017)," ESR 3 conducted an analysis of more than 34,000 donors and 265,000 donations from a large university hospital's blood center using data from July 2008 to December 2017. The research paper provided initial insights into the current situation and aimed to guide future work that focused on assessing the effectiveness of strategies to attract blood donations in a safe manner. The analysis focused on (a) whole blood donations and (b) donor characteristics and how they changed over time. In line with other regions in Germany, the Netherlands, and Switzerland, the study authors observed declining donations and donors. The trends observed in the blood donation context appeared to contradict a broader trend observed in prosocial activities across Germany, as reported in the case of volunteerism. The findings are relevant to blood collection agencies in that they provide information for guiding future recruitment campaigns.
Chandler, T., Hiller, J., Peine, S., & Stargardt, T. (2019). Blood donation and donors: insights from a large German teaching hospital. Vox sanguinis, 115(1), 27-35.

RP 2: The second research paper, "A comparison of strategies to attract blood donors: an assessment of cost and benefit," aimed to evaluate the effectiveness of two events on a) total blood donations and b) first-time donations in a public hospital setting. In addition, the cost and benefit of the events from the perspective of the blood donation center were estimated. The study authors utilized administrative data from the Universitätsklinikum Hamburg-Eppendorf (UKE), a hospital with a substantial share in the blood donation market in Hamburg, Germany, and data from a second blood donation center (Albertinen House). A DiD analysis was conducted to identify the

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

causal effects of a hospital-based “Bikers Blood for Help” (BBFH) day. BBFH was a biker-themed open-air event with live music that was held in 2015, 2016, and 2017 in collaboration with local motorcycle enthusiasts and that aimed to promote blood donations. A second event called “Action 100 week,” in which students aimed to obtain 100 new donors in a week, was also analyzed. The findings suggest that events aimed at encouraging additional donations and new donors can be an effective tool for attracting first-time donors during the short term. However, both blood donation events had only a small effect on eliciting blood donations in the weeks after they had taken place. The net benefit of the events was found to be negative from the perspective of purely collecting blood reserves. The results of this study may provide guidance for blood donation centers considering campaigns to increase donor recruitment and may encourage them to develop strategies to attract regular donors (along with first-time donors) and incentivize them to return in the long run. The title of the working paper is:
Chandler, T., Hiller, J., Peine, S., & Stargardt, T. A comparison of strategies to attract blood donors: An assessment of cost and benefit.

RP 3: The COVID-19 pandemic has had an unprecedented impact on blood transfusion and collection through large-scale disruptions to the supply and demand for blood. In the third research paper, ESR 3 aimed to provide early insights into the impact of COVID-19 on blood donors and their motivations to donate during the COVID-19 crisis. A total of 7000 people were asked about their blood donation activity and motivation to donate through a representative online survey across 7 European countries (Denmark, France, Germany, Italy, Portugal, the Netherlands, and the United Kingdom)**.** Of the 7,122 people who responded to the survey, 1,205 (16.9%) blood donors were identified across the 7 European countries, with 33.8% donating during the first 4-5 months of the COVID-19 period. We observed that although half of the donors donated

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

less during the COVID-19 pandemic than they normally would, most of those who donated made a special effort to do so. Furthermore, survey respondents who anticipated a high risk of infection were much less likely to donate. The results suggest that blood collection services consider specialist campaigns that focus on the altruistic motivation of donors during the crisis and continue to reassure donors of the safety measures in place at their centers. Last, the majority of donors appear to have not been incentivized by COVID-19 antibody tests, which could be considered along with free health checks as incentives to elicit blood donations.
Chandler, T., Neumann-Böhme, S., Sabat, I., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., Torbica, A., & Stargardt, T. Blood donation in times of crisis: early insight into the impact of COVID-19 on blood donors and their motivation to donate across European countries. [Manuscript submitted for publication].

RP 4: In the fourth paper, "The impact of temporary deferrals on future blood donation behavior across the donor life cycle," data from more than 123,000 whole blood donors of the Austrian Red Cross during a period of 5.5 years were used. Logit models were estimated to analyze how deferral affects future donation behavior while controlling for potential selection biases because donors are not randomly deferred. Sex, blood type, and donor experience were controlled. The direct deferral effect and its interaction with donor experience were analyzed to show the impact across different donor groups. The results confirm that temporary deferrals hurt future donation behavior. On average, donors' likelihood of donating decreases by 4%. The effect diminishes donor experience: the negative effect is strongest for first- and second-time donors, but experienced donors who have donated four times or more are even more likely to return after a deferral. Blood banks should develop strategies to overcome the negative effect of temporary deferrals on novice donors' donation likelihood. However, temporary deferrals seem to motivate experienced donors to return to donate, which

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

may require new strategies to avoid risky donations that may be concealed by overly motivated experienced donors.

Chandler, T., Clement, M., & Shehu, E. The impact of temporary deferrals on future blood donation behavior across the donor life cycle. [Manuscript submitted for publication].

ESR 4: Exploiting administrative databases to improve evidence. Research papers 2017-2020

RP 1: In the research paper, "Investigating the geographic variation of elderly hospital readmission in Italy: What are the Trade-offs between Length-of-stay and Readmission Cost?" in PhD topic 4, the ESR looked into the predictors for early readmission and how the risk differs across regions in Italy, with a specific focus on elderly patients diagnosed with acute myocardial infarction. Hospital discharge information (2010-2015) from more than 460,000 patients is used to employ a multilevel hazard model and a two-part model with an instrumental variable. The main finding indicates that length of stay, being female, education, and discharged to institutions are negatively associated with the propensity for readmission, whereas higher patient volume and lower capacity hospitals at the hospital level tend to have lower readmission. Local health authority-managed hospitals have the highest readmission probability. There is substantial variation across different regions; on average, increasing the length of stay reduces the overall episode hospitalization costs.

Wang, Y., Torbica, A., & Ghislandi, G. (2020). Investigating the Geographic Disparity in Quality of Care: The Case of Hospital Readmission after Acute Myocardial Infarction in Italy. European Journal of Health Economics, 21, 1149-1168.

RP 2: The great economic crisis in 2008 affected the welfare of the population in countries such as Italy. The second research paper in PhD topic 4 investigated the

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

impact of the recent economic crisis on hospital admissions for severe mental disorders at small geographic areas in Italy and assessed whether heterogeneous effects exist across areas with distinct levels of income. ESR 4 exploited 9-year (2007-2015) panel data on hospital discharges and merged them with employment and income composition at the geographic units that share similar labor market structures. Linear and dynamic panel analyses are used to identify the causal effect of increasing unemployment rates on severe mental illness admissions per 100,000 residents to account for time-invariant heterogeneity. ESR 4 further created discrete income levels to identify the potential socioeconomic gradients behind this effect across areas with different economic characteristics. The results show a significant impact of higher unemployment rates on admissions for severe mental disorders after controlling for relevant economic factors, and the effects are concentrated on the most economically disadvantaged areas. The results contribute to the literature on spatiotemporal variations in the broader determinants of mental health and health care utilization and shed light on the populations that are most susceptible to the effects of the economic crisis.

Wang, Y. & Fattore, G. (2020). The impact of the great economic crisis on mental health care in Italy. European Journal of Health Economics, 21, 1259-1272.

RP 3: Contemporary commentators describe the current period as “an era of fake news” in which misinformation, generated intentionally or unintentionally, spreads rapidly. Whereas examples of the rapid spread of misinformation date back to the earliest days of scientific medicine, the Internet allows instantaneous communication and powerful amplification, which has brought about a quantum change. To uncover the current evidence and better understand the mechanism of health-related misinformation spread, ESR 4 reported a systematic review of the nature and potential drivers of health-related misinformation. The study authors searched the PubMed, Cochrane,

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Web of Science, Scopus, and Google databases to identify relevant methodological and empirical articles published between 2012 and 2018. A total of 57 articles were included for the full-text analysis. Overall, an increasing trend in published articles on health-related misinformation was observed. The most extensively studied topics involving misinformation were related to vaccination and the Ebola and Zika viruses. Other topics, such as nutrition, cancer, fluoridation of water, and smoking, are also featured. Studies adopted theoretical frameworks from psychology and network science, and cocitation analysis revealed the potential for greater collaboration across fields. Most studies employed content analysis, social network analysis, or experiments and drew on disparate disciplinary paradigms. Future research should examine the susceptibility of different sociodemographic groups to misinformation and understand the role of belief systems on the intention to spread misinformation. Further interdisciplinary research is also warranted to identify effective and tailored interventions to counter the online spread of health-related misinformation.

Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic Literature Review on the Spread of Health-related Misinformation on Social Media. Social Science & Medicine, 240, 112552.

RP 4: Following the global trend of moving toward universal health coverage, China implemented a new round of health system reforms to achieve universal "safe, effective, and affordable basic health care services" by 2020. ESR 4 reviewed the latest reforms using the WHO framework developed by Murray and Frenk. In particular, the study authors diagrammatically describe the structure of the current Chinese health system using the dimensions of stewardship, resource generation, financing, and provision and assess the variability of access, benefit levels, and service quality across populations. Several areas of inequity and inefficiency were identified. First, fragmented institutional arrangements with distinct objectives and responsibilities

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

across agencies create the potential nonalignment of incentives. Second, qualified general practitioners and infrastructures are noticeably scarce despite the continuing effort to improve the gatekeeping function of primary care providers. Third, because risks are pooled only at the local level in different insurance schemes, the considerable income heterogeneity across geographic territories and resident types can generate significant inequality in access and funding. Fourth, persistent patient preference for higher-quality health care at hospitals prevents the integration of care across tiers. The results inform health policy makers and researchers in identifying and investigating the inefficiencies of the health system and the potential for structural integration to achieve health care equity.

Wang, Y., Castelli, A., Qi, C., & Liu, D. Assessing the Design of China's Complex Healthcare System - Concerns on Equity and Efficiency. [Manuscript submitted for publication].

RP 5: In the fourth research paper, ESR 4 investigated the free patient choice of health care providers using quality indicators (in-hospital mortality and 30-day readmission rate) derived from past global and local events in the Italian context. The former is the overall mortality or readmission rate experienced by all observed patients, and the latter is the same failure rate experienced only by patients from the same municipality. The study authors further split the quality indicators into procedure-specific and all-cause mortality and readmission to observe whether patient sensitivities differ. The analysis exploited a dataset of all Southern Italian patients over 65 years of age who underwent hip replacement surgery from 2012 to 2015 and built on a patient-level additively separable utility function to obtain the random utility choice model. The influence of lagged quality indicators was explored, and all observed hospital characteristics and travel time on individual choice when controlling for hospital patient volume, case mix, and other fixed effects. The population was divided into rural and nonrural residents, given disparate constraints. The results suggest that the choice

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

of hospitals has a significant neighborhood effect, whereas the local quality indicator strongly influences the choice of hospital among rural residents. However, patients in nonrural areas tend to choose hospitals with better global qualities. Moreover, patient tastes vary substantially over quality and travel time, and choices are differentially affected by failure events of distinct degrees of severity. Overall, the study reveals that although patients value objective quality indicators when choosing their preferred hospitals, those from smaller towns are more sensitive to quality information derived from one's vicinity. The title of the working paper is:
Wang, Y. Hospital Quality and Patient Choice: Is There a Neighborhood Effect?

2.3. WP 3 Research cluster "Efficiency"

PhD 5: Do pay-for-performance and public reporting impact quality of care?
PhD 6: Competition and quality of care in primary care
PhD 7: Price of hospital care and its impact on quality of care
PhD 8: Improving efficiency of care using medical technology

The clusters' objectives achieved are as follows:
In the first phase of the ETN, all ESRs participating in WP 3 performed comprehensive reviews for their respective PhD topics. They used the reviews as the basis for the development of analytic models and data requirements for empirical papers. In the second phase, all of the study authors obtained and prepared data from, among others, our cooperation partners (Table 3) and developed appropriate econometric models for their research questions. In the final phase of the ETN, the ESRs wrote up their findings and drew out implications when presenting their results in scientific publications and at international conferences. In total, 11 RPs were written in the research cluster "Efficiency." In the following, please find an overview of the RPs carried out in WP 3 from each ESR.

Marie Skłodowska-Curie Actions
Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

The datasets in WP 3 that the ESRs have exploited are as follows:

ESR Nr.	Dataset
ESR 5	Data from Statistics Denmark and Sundhedsdatastyrelsen (Danish health board)
ESR 6	Performance indicators and some contextual characteristics of primary care trusts in Portugal provided by the central administration of the NHS; socioeconomic data from the National Statistics Institute (INE)
ESR 7	Hospital and patient data from Techniker Krankenkasse (TK) (German sickness fund)
ESR 8	EHRA (European Heart Rhythm Association), Google Analytics

Table 3: Datasets in WP 3

ESR 5: Do pay-for-performance and public reporting impact quality of care? Research papers 2017-2020

RP 1: In the first research paper, "Evaluation of an Electronic Health Record System with a Disease Management Program and Health Care Treatment Costs for Danish Patients With Type 2 Diabetes," ESR 5 investigated how type 2 diabetes patients' average annual health care costs were affected by their GP's use of an electronic health record (HER) system with a built-in disease management program (DMP) and performance feedback facility. An annual panel of type 2 diabetes patients attending the same GP between 2008 and 2014 was used. Some GPs began to use the system in 2012, and other GPs never used the system. The main analytical problem is that GPs' use of the EHR/DMP was self-determined. Consequently, unobserved differences between GPs, such as having a particular interest in diabetes management, could differently affect GPs' responses and treatment patterns rather than the system itself, which is a concern. This analytical problem is mitigated by excluding GPs who achieved a high level of EHR/DMP system use in the first year of its availability (i.e., first movers believed to have a particularly strong interest in diabetes) and by applying GP-level fixed effects.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

This approach amounts to a differences-in-differences framework and is compatible with making causal inferences conditional on a common trends assumption. Overall, ESR 5 and his collaborators did not find a significant net change in average annual treatment costs among patients attending GPs who used the system. Evidence exists of a 3.2% increase in average annual primary care costs and a 6.4% decrease in emergency hospital costs, although no significant net difference exists in hospital costs. This finding is interpreted as evidence of a procedural efficiency improvement through which patients attending GPs who used the system were better referred to hospitals rather than visiting hospitals in emergency circumstances.
Pulleyblank, R., Mellace, G., & Olsen, K.R. (2020). Evaluation of an Electronic Health Record System with a Disease Management Program and Health Care Treatment Costs for Danish Patients with Type 2 Diabetes. JAMA Network Open, 3(5), e206603.

RP 2: In the second research paper, "Cost and Quality Impacts of Treatment Loci for Type 2 Diabetes Patients with Moderate Disease Severity: Hospital- vs. GP-Based Monitoring," published as part of the Danish Centre for Health Economics Discussion Paper series (2020:1), an annual cross-section of patients was used to assess the potential impact of disease monitoring location (i.e., general practice vs. hospital outpatient clinic) on health care treatment costs and quality (i.e., emergency hospitalizations). ESR 5 used a two-stage least-squares (2SLS) instrumental variable approach, with moderate disease patients' distance to the nearest hospital-based specialist clinic as the instrument for the treatment locus, to estimate a "local average treatment effect" (a causal estimate) of the impact of treatment locus on health care costs and quality indicators. The study authors estimated that hospital-based disease management is more expensive overall for those who comply, and there is no difference in emergency hospitalizations. That is, there is fair reason to believe that the Danish health care policy that moves disease management from the hospital sector to

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

the primary care sector can genuinely reflect an efficiency improvement (i.e., cost reduction without quality reduction).
Pulleyblank, R., Laudicella, M., & Olsen, K.R. Cost and quality impacts of treatment loci for type 2 diabetes patients with moderate disease severity: Hospital- vs. *GP-based monitoring. [Manuscript submitted for publication].*

PhD 6: Competition and quality of care in primary care. Research papers 2017-2020

RP 1: The first research paper, "Measuring efficiency in the primary care management of chronic diseases, maternal and child health care," in PhD topic 6 was an empirical analysis to assess the efficiency of primary care organizations in Portugal. ESR 6 used costing data and constructed different cost functions considering quantitative outputs (number of visits) and qualitative outputs related to the provision of care to patients with diabetes, pregnant women, and childcare prevention (3 aggregate clinical quality indexes). Parametric methods based on stochastic frontier analysis were applied to understand the production function (and associated costs) for quality improvements and the determinants contributing to it from an increase in scale or a reduction in inefficiencies and to compare the cost and efficiencies between providers. ESR 6 used a recent database of costs at the practice level covering the period between 2016 and 2018 and employed a stochastic frontier estimation framework. The main findings suggest that, despite the descriptive evidence pointing to differences in terms of costs, production, and skill mix between the team-based models and salaried practices, these practices' cost functions do not differ significantly for small practices (below the third quartile of production). This indicates that team-based practices benefit from increasing their scale of production to attain cost reductions. Policies aimed at increasing efficiency should consider the existence of economies of scale.
The title of the working paper is:

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Pestana, J. & Barros, P.P. Measuring efficiency in the primary care management of chronic diseases, maternal and childcare.

RP 2: In the second research paper, ESR 6 examined the impact of the global financial downturn and crisis-induced policies leveraged by the fiscal adjustment program (2011-2014) on the risk-adjusted quality indicators of family practices. ESR 6 explored the regional variation in socioeconomic conditions in municipalities affected by the crisis. The study authors applied quasi-experimental techniques using administrative data from 870 family practices from 2011 to 2018. A set of indicators of process and intermediate outcomes were used as proxies for quality improvements in the practices. These indicators pertained to screening and follow-up for diabetes, high blood pressure, maternal health, and child health. ESR 6 showed that the improvement in the socioeconomic conditions postcrisis had, on average, a very mild positive effect on utilization rates and the quality of care provided to patients with chronic conditions, whereas the effect on the quality of care provided to children was statistically insignificant. Despite the trend in improvement in the process of the care dimension of quality of care, regional socioeconomic conditions play a role in explaining the differences in the quality indicators, particularly in practices without a family health unit (FHU) organization. The redesign of practices using multidisciplinary teams and applying financial incentives have most often been used as part of programs to achieve better outcomes and can also improve the teams' resilience to economic shocks.
The title of the working paper is:
Pestana, J. & Barros, P.P. Impact of socioeconomic conditions on the performance/quality indicators of the primary care units.

RP 3: Paying for quality has a strong intuitive appeal; however, the empirical evidence on its effectiveness in health care is mixed. One concern arises from the potential

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

piecemeal attention paid to some aspects of quality that might encourage the neglect of nonincentivized aspects. ESR 6 designed a controlled experiment based on economic agency theory under multitasking to unveil whether and how (P4P) incentive contracts can direct practitioners' focus toward/away from certain activities (effort direction) and influence how hard they work (effort intensity). During the experiment, medical students are asked to perform four real-effort tasks that can be substitutes or complements in the effort between them. This type of experiment requires a controlled environment (university laboratory) in which participants are observed when solving a task. Running the experiment was made impossible after March because of the closure of the university lab. The main part of the experiment was postponed to early next year. The results will contribute to explaining the current misalignment between the theoretical literature that predicts a negative spillover effect of P4P rewards over nonrewarded tasks if these are substitutes and the growing work that empirically rejects this effect. The results will also provide important considerations for the design and evaluation of P4P programs.
The title of the working paper is:
Pestana, J., Attema, A., & Wiesen, D. Do performance-based incentives prompt "tunnel vision" behaviour? - A multitasking real-effort experiment.

ESR 7: Price of hospital care and its impact on quality of care. Research papers 2017-2020

RP 1: Limited empirical evidence exists regarding the effect of price changes on hospital behavior and, ultimately, the quality of care. The first paper in PhD topic 7 aimed to provide an overview of the current evidence on how price affects the quality of care in the hospital setting. Therefore, ESR 7 conducted a literature review on studies analyzing the association between price and quality of care in hospitals, including

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

studies published between 1990 and March 2019 from four electronic databases. In total, 47 studies were identified. The study findings are highly heterogeneous. The proportion of studies detecting a significant positive association between price/cost and the quality of care is higher when (a) price/reimbursement is used (instead of cost); (b) process measures are used (instead of outcome measures); (c) the focus is on acute myocardial infarction, congestive heart failure, and stroke patients (instead of patients with other clinical conditions or all patients); and (d) the methodological approach used to address confounding is more sophisticated. The results suggest that no general relationship exists between cost/price and the quality of care. However, the relationship seems to depend on the condition and specific resource utilization. Policy makers should be prudent with the measures used to reduce hospital costs to avoid endangering the quality of care, especially in resource-sensitive settings.
Jamalabadi, S., Winter, V., & Schreyögg, J. (2020). A Systematic Review of the Association between Hospital Cost/price and the Quality of Care. Applied Health Economics and Health Policy, 18, 625-639.

RP 2: The second research paper aimed to identify the effect of hospital competition on the quality of care for AMI patients. The study authors assumed that a hospital that provides the best combination of quality and geographical distance for a patient would be chosen, maximizing the patient's utility. To measure the competitiveness that each hospital faces, the distance weighted method was employed, which assigns weights by the number of AMI admissions and inversely by distance. For each AMI patient, quality of care was assessed based on outcome measures, including cumulative mortality and readmission. The results suggest that patients in low competition areas are more likely to survive than patients in high competition areas. Patients either admitted to the hospital as an emergency or transferred from other hospitals are less likely to survive, and patients living closer to hospitals had better health outcomes. Our findings show

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

that hospitals in low competition markets in Germany are more likely to better negotiate for their needs and may receive higher subsidies from the federal government to upgrade their infrastructures. Therefore, they may have better facilities to provide better quality of care. In addition, hospitals' tendency to discharge patients faster in high competition areas may also explain our result because doing so may threaten the patient's quality of care, such as higher mortality after discharge. In conclusion, the effect of competition on quality of care highly depends on the institutional context, and policy makers should pay attention to the context in which they consider reforms in the competition in health care.

The title of the working paper is:

Jamalabadi, S., Bayindir, E.E., Schneider, U., & Schreyögg, J. The effect of hospital competition on patients outcomes - Insights from the German hospital market.

ESR 8: Improving efficiency of care using medical technology. Research papers 2017-2020.

RP 1: In the first research paper, ESR 8 evaluated the influence of clinical practice guidelines on the diffusion of medical technology. To do so, ESR 8 investigated the diffusion of cardiac resynchronization therapy (CRT) for heart failure (HF) in the United Kingdom as an example. The dataset published in the European Heart Rhythm Association (EHRA) White Book project (EHRA, 2018) provided the number of technology implantations per million inhabitants in the United Kingdom per year. To connect the insights into the EHRA dataset to real-world clinical awareness, searches for CRT conducted using Google's search engine in the United Kingdom were analyzed. The econometric model was developed using the time-series data from Google searches. The Google search time series provided monthly data points, that is, the monthly average of searches related to CRT in Google, to evaluate the changes in CRT

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

clinical practice awareness from January 2004 to June 2018. The dynamic ARIMA (AutoRegressive Integrated Moving Average) model was specified by regressing the time series of Google searches as the dependent variable on independent variables of changes in guidelines published by the national, European, and US guideline bodies. The study authors observed that Google searches (and, presumably, awareness as a proxy for diffusion) correlated with some of the changes to the guideline recommendations made at the national and US levels. However, the study authors observed no such correlation with the changes recommended at the European level. The study highlights the influence of guideline changes on awareness and identified factors that may encourage or discourage the translation of guideline recommendations into technology diffusion.

Vadia, R. & Stargardt, T. (2020). Impact of guidelines on the diffusion of medical technology: a case study of cardiac resynchronization therapy in the UK. Applied Health Economics and Health Policy.

RP 2: The second study investigated the role of external funding to innovate on cardiovascular medical devices across 31 countries in Europe. The study relies on the knowledge production function (KPF) framework that establishes the knowledge output of a region as a function of innovatory effort and other characteristics of that same region. In a cross-sectional analysis, ESR 8 investigated regional variations in knowledge production using the number of publications in cardiovascular device research obtained from the bibliometric data of the world's largest biomedical library—the U.S. National Library of Medicine, 2014–2017. ESR 8 developed an algorithm to map these publications to product categories of medical devices approved for cardiovascular diseases by the U.S. Food and Drug Administration. Considering the spatial correlation across regions of Europe in the estimates of the KPF, the model analyzes the impact of two types of funding mechanisms: grants reported in the

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

publications and the volume of European Union Horizon 2020 funding received by the innovating regions. Obtained were 123,487 cardiovascular device-related publications distributed across 1,051 (75% of total) regions (NUTS-3 level). Receiving external funding strongly contributes to knowledge output in the region. The estimated elasticities of the innovatory effort range between 0.51 and 0.68. These estimates were consistently larger (0.17–0.56) than the elasticities of other characteristics in the region measured by gross domestic product (0.24–0.56). The results also document spillover effects from neighboring regions when funding was measured by grants reported in publications. The study authors conclude that innovatory effort in the form of external research investments is effective in promoting innovation in the medical device industry at the regional level.

The title of the working paper is:

Vadia, R. & Blankart, K. Regional innovation systems of medical technology: A cross-sectional analysis of cardiovascular research & funding.

RP 3: The disease progression of critical limb ischemia (CLI) can be prevented by timely and clinically appropriate endovascular intervention. However, poor health outcomes in patients with CLI continue to persist in Germany and are, in part, believed to be the result of a lack of timely intervention. The third research paper by ESR 8 adopted the German health care system perspective and evaluated the cost-effectiveness of timely versus delayed endovascular intervention using bare-metal stents (BMSs). A Markov model for a five-year time horizon was developed with seven states: intervention, stable (no further treatment required), major amputation, reintervention, comfort care (no reintervention possible), and all-cause death. The intervention state consisted of a BMS intervention in one arm of conservative treatment using pharmacotherapy in the other. The reintervention state consisted of first or second BMS interventions in both arms. Primary outcomes were quality-adjusted life years (QALYs), costs, and

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

incremental cost-effectiveness ratios (ICERs). Scenario analysis was performed in which patients could undergo more than one and up to three reintervention states in one cycle. The results suggest that timely endovascular intervention with BMS is more costly but also generates more QALYs in early-stage CLI patients when clinically feasible.

The title of the working paper is:

Vadia, R. & Stargardt, T. Cost-utility analysis of endovascular intervention in early-stage CLI patients.

2.4. WP 4 Research cluster "Access and Equitability"

PhD 9: The effect of hospital volume on quality of care

PhD 10: Comparing quality of care across health care systems

PhD 11: Does inequity in access to secondary care impact quality of care?

The clusters' objectives achieved are as follows:

In the first phase of the ETN, all ESRs participating in WP 4 performed comprehensive reviews for their respective PhD topics. The reviews were used as the basis for the definition of analytic models for empirical papers or were included in stand-alone review papers. In the second phase, all study authors obtained and prepared data from, among others, our cooperation partners (Table 4) and developed appropriate econometric models for their research questions. In the final phase of the ETN, the ESRs wrote up their findings, drew out implications, and presented their results in scientific publications and at international conferences. In total, 10 RPs were conducted in the research cluster "Access and equitability." In the following, please find an overview of RPs carried out in WP 4 from each of the ESRs.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

The datasets in WP 4 that the ESRs have exploited are as follows:

ESR NR.	Dataset
ESR 9	Hospital Episode Statistics (HES) from NHS Digital; patient-reported outcome measures (PROMs) from NHS Digital
ESR 10	Administrative data from the Barmer GEK (German sickness fund); socioeconomic data from the INKAR database; Italian Ministry of Health SDO data (discharge records)
ESR 11	Data from Statistics Denmark and Sundhedsdatastyrelsen (Danish health board)

Table 4: Datasets in WP 4

ESR 9: The effect of hospital volume on quality of care. Research papers 2017-2020:

RP 1: The first research paper, "The causal effect of hospital volume on health gains from hip replacement surgery," in PhD topic 9 aimed to understand whether increasing hospital volumes have a positive effect on health outcomes in the context of planned hip replacement using administrative hospital data in England. ESR 9 obtained data on patient-reported outcome measures (PROMs) and routine administrative data on hospital utilization for recent years from NHS-England. The effect of hospital volume on health outcomes was investigated by regressing patients' postsurgical health status on hospitals' yearly volumes in an ordinary least squares regression. The results suggest that hospital volume does not have a causal impact on hip-specific patient-reported health outcomes for planned primary hip replacements in the English NHS, indicating that positive economies of scale are not a valid argument to further concentrate care provision. Concentrating on the provision of planned hip replacements in the English NHS would not result in better health outcomes and may have adverse effects on patient access to care.

Rachet-Jacquet, L., Gutacker, N., & Siciliani, L. Scale economies in the health sector: The effect of hospital volume on health gains from hip replacement surgery. [Manuscript submitted for publication].

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 2: The study, "The Effect of Surgeon Breaks on Patient Health Outcomes: Evidence from Hip Fracture Emergency Care," in PhD topic 9 contributes to the literature on surgeon skills by exploring the role of work schedules on quality of care. In particular, the study investigates the effect of time away from the operating theatre on surgeons' performance. Using hospital records for all emergency hip fracture patients in the English National Health Service, ESR 9 constructed a panel dataset of more than 2,000 orthopedic surgeons between 2009 and 2016. The empirical strategy estimates whether surgeons' time breaks, defined as the number of days since their last surgery, affect patients' 30-day mortality rates after a hip fracture, controlling for a rich set of patients' medical and socioeconomic characteristics. To identify a causal effect, ESR 9 implemented a surgeon fixed-effects model and exploited the variation in time breaks that arises from unanticipated emergency hip fracture admissions. The results show that short breaks of 4-6 days reduce 30-day mortality rates by approximately 6%. Notably, short breaks also lead to longer postsurgical lengths of stay and affect the type of surgical treatment. Overall, these findings suggest that the positive effects of surgeon breaks on patient health outcomes may result from better treatment choices after short breaks. This study, which is not yet available as a working paper, has been disseminated on various occasions, including national and international conferences (i.e., the Health Economics Study Group workshop in Newcastle (UK), the Health Economics and Data Group seminar in York (UK), and the American Society of Health Economists conference (held online)).

The title of the working paper is:

Rachet-Jacquet, L. The Effect of Surgeon Breaks on Patient Health Outcomes: Evidence from Hip Fracture Emergency Care.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 3: The study, "Does containing costs reduce hospital quality? The case of same-day discharge in the English National Health Service," provides novel evidence on the organization of hospital care services. To ensure the sustainability of health systems, policy makers aim to contain costs without affecting the quality of care. In this study, ESR 9 investigated the causal effect on patient health outcomes of reducing inpatient length of stay by discharging patients on the same calendar day of the admission (28-day emergency readmissions). Using hospital administrative data for English NHS hospitals between 2010 and 2014, the study focuses on emergency patients presenting chest pain symptoms, a common reason for attendance at the accident and emergency department. The ESR 9 implemented an instrumental variable strategy to account for possible omitted-variable bias resulting from unobserved patient severity. The instrument used variations in patient exposure to a major 2012 policy that financially incentivized hospitals to discharge patients on the same day of admission. Ordinary least squares (OLS) results show that being discharged on the same day is associated with lower 28-day emergency readmission rates by approximately 0.8 percentage points (approximately 10%). Instead, the instrumental variable approach suggests no causal effect of being discharged on the same day on the patient probability of being readmitted in 28 days. Therefore, the results suggest that cost reductions can be achieved without affecting the quality of care.

The title of the working paper is:

Rachet-Jacquet, L., Gaughan, J., Gutacker, N., & Siciliani, L. Does containing costs reduce hospital quality? The case of same-day discharge in the English National Health Service.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

ESR 10: Comparing quality of care across health care systems. Research papers 2017-2020:

RP 1: In PhD topic 10, a systematic review of stroke quality of care was performed in September 2017 (updated June 2019) following PRISMA guidelines. The purpose of this systematic review was to analyze the most common outcome indicators to assess hospital quality and to explore the variables that may significantly affect hospital quality evaluations. To this end, ESR 10 narrowed the research to acute stroke treatment in European countries. Overall, 36 studies from PubMed and 25 journal articles from EconPapers were included in the analysis. Forty-one of them focused on stroke events. As the results showed, mortality in 30 days from discharge was the main outcome indicator employed to measure hospital quality. At the patient level, both clinical and sociodemographic characteristics were included in the risk adjustment. At the hospital level, the majority of the studies selected miscellaneous factors, including process of care indicators and hospital market characteristics. In conclusion, hospital quality evaluation could become either an incentive to improve provider performance or a standardized tool for monitoring purposes in imperfect hospital markets. A comprehensive quality of care evaluation across hospitals requires the inclusion of a composite outcome measurement and a multilevel adjustment. As the results also showed, public reporting of hospital performance can lead to unexpected financial consequences and unintended effects: hospital stigmatization and outcome mislabeling. However, this should not discourage the pursuit of measuring health care quality.

The title of the working paper is:

Meggiolaro, A., Semenova, A., Caltagirone, C., & Schreyögg, J. Evaluating quality of stroke care in European countries: A systematic review.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 2: The second research paper in PhD 10 presents an econometric approach to measure hospital quality performance in Germany. Using administrative data from a statutory health insurer in Germany from 2005 to 2016, ESR 10 applied a two-stage regression approach to estimate hospital quality for four cardiovascular interventions: elective coronary bypass graft (CABG or bypass), elective cardiac resynchronization therapy (ICD/CRT), and emergency treatment for ST (STEMI) or non-ST elevation (NSTEMI) acute myocardial infarction (AMI). Mortality and readmissions were used as quality outcomes. The hospital estimates obtained in the first stage were aggregated in the second stage and normalized into an index ranging from zero to 10. The precision-based weights calculated in the first stage were higher for mortality than for readmissions. In general, teaching hospitals performed better in our ranking of hospital quality compared with nonteaching hospitals, as did private, not-for-profit hospitals compared with hospitals with public or private for-profit ownership. Overall, AFT models are more efficient than models that rely on dichotomized data. The main advantage of the variance-based weights approach is that the extent to which an indicator contributes to the aggregate index depends on the size of its variance. Moreover, the risk adjustment reduces the potential hospital selection bias. *Meggiolaro, A., Blankart, R., Stargardt, T., & Schreyögg, J. A methodological approach to aggregate multiple measures of hospital quality using variance-based weights. [Manuscript submitted for publication].*

RP 3: The aim of the third research paper was to replicate the previous quality index application across European countries. For this purpose, ESR 10 obtained data from the Italian Ministry of Health through a collaboration with Bocconi University-CERGAS, Milan (IT). In this study, ESR 10 relaxed the time-lapse constraint since a system of accelerated failure time (AFT) regressions was applied, which was more efficient and informative than models relying on dichotomized data. Moreover, ESR 10 provided

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

league tables to rank hospitals to observe the role of ownership in hospital performance. A total of 454 hospitals in Germany and 571 hospitals in Italy were evaluated. According to the research findings, Germany performed better than Italy in CVD readmissions. The mean rank of German hospitals was 5.2 compared with 3.13 reported by the Italian sample. Concerning ownership, private, not-for-profit hospitals performed better in Germany, but it was not possible to establish the ownership role for Italy because 84% of the sample was represented by public hospitals (480/571). ESR 9 concluded that the variation could be explained by different hospital market structures. The method proposed in this paper provides a valid basis for assessing the quality of hospitals, and its use may encourage—at least indirectly—quality-based competition in competitive hospital markets.

The title of the working paper is:

Meggiolaro, A., Torbica, A., Blankart, R., & Schreyögg, J. Comparing health care systems in Europe: A quality index approach based on hospitals' performance.

ESR 11: Does inequity in access to secondary care impact quality of care? Research papers 2017-2020:

RP 1: General practitioners (GPs) play a vital role in many health care systems. However, variations exist in how they treat their patients; thus, these variations may lead to inequalities in access to care for patients. In the PhD 11 topic, the ESR explored variations in treatment behavior and access to care by investigating whether and how they react to financial incentives or whether they alter their behavior prior to retirement. In the first research paper, ESR 11 investigated whether GPs' retirement decisions are correlated with changes in their effort level and, thus, access to care for their patients. Using detailed administrative data, ESR 11 compared retiring GPs' effort levels to both matched and unmatched nonretiring GPs during a ten-year period. He

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

measured GPs' effort level by the quantity of services, the service composition, and the quality of care provided as well as the number of enlisted patients. The findings suggest that retiring GPs have fewer patients on their lists four years up to retirement than nonretiring GPs. This result is driven by patients leaving the practices. Another finding indicates that retiring GPs have more outpatient attendance for patients with ambulatory care-sensitive conditions, indicating a worsening of their gatekeeping role. This worsening is in fact driven by GPs retiring younger than the age of 65. However, no evidence of retiring GPs having different rates of referrals to other private practicing specialists was found. In conclusion, the results only indicate a minor change in behavior and, thus, represent a reassuring result for policy makers and patients. *O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Time to Retire? A register-based study of GPs' effort prior to retirement. [Manuscript submitted for publication].*

RP 2: The aim of the second paper was to investigate whether a financial incentive targeted at retiring GPs causes such GPs to alter their treatment behavior in the few years before their year of retirement. As the previous work indicated there is some evidence of GPs winding down until the day of retirement, an incentive may ensure that these retiring GPs maintain their activity levels and, thus, minimize potential inequalities in access to care. ESR 11 investigated whether a financial incentive present for retiring Danish GPs leads to changes in their billing behavior three years before their day of retirement. To assess the potential consequences of GPs responding to such an incentive, ESR 11 investigated GP billing behavior from 1999 to 2010 and exploited the reduction in the value of the incentive over time using linear regressions with GP and time fixed effects. The results suggest some evidence of GPs responding to the incentive. When the incentive is large, retiring GPs have increased revenues. However, when the incentive is low, retiring GPs seem to have decreased revenues. However, there does not

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

appear to be a trend in the differences in revenue, which would have been expected if the incentive had played a key role in GPs' billing behavior. Limited evidence suggests that the response to the incentive is not heterogeneous because GPs in less populated areas and GPs with previously low activity appear to have further reduced revenues as they approach retirement.

The title of the working paper is:

O'Halloran, J. Can we pay soon-to-retire GPs to work more? An analysis of the effect of "goodwill payments" on GP behavior.

RP 3: Home visits constitute approximately 1.5% of the GPs' revenue, with 130 average home visits conducted annually. The fees for home visits increased for GPs by an average of 150% in 2018, with the largest increases for fees for the furthest distances. The third paper investigated whether the fee increase led to increased provision of services and was associated with improved access to care. Changes in fees are a potential instrument to influence physician behavior. Therefore, a need exists to understand how physicians may respond to increases in fees as a mechanism to incentivize behavior. ESR 11 first conducted a sample before and after analysis and found no evidence that GPs at an aggregate level responded to the fee increase. ESR 11 then exploited the concept that GPs are affected at different intensity levels. The results suggest that only practices with the greatest proportion of eligible patients who had not previously received a home visit responded positively to the fee change, increasing the total number of home visits by 13%. However, they did not visit any more patients and only provided more home visits to the same number of patients. Thus, the policy change resulted in no real improvements to access to care because the same number of patients received home visits. Study authors then tested whether this increase in provision acted as a substitute or had any spillover effects, and no evidence of either was found.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Home sweet home: Do physicians respond to fee changes for home visits? [Manuscript submitted for publication].

RP 4: The fourth research paper also investigated GP responses to changes in the fee size of home visits, particularly whether Danish GPs upcode their travel fees for home visits and physician income relies on self-reported activities and performances. To maximize remuneration, physicians may be tempted to game the system. Evidence is scarce on whether physicians exhibit gaming behavior and whether the size of the financial gain drives this behavior. Combining administrative and geographical data, ESR 11 measured the difference between GPs' reported travel distances and actual travel distances. The results suggest evidence of GPs exhibiting gaming behavior because the proportion of home visits upcoded over 4 km and less than 20 km is 16%, whereas only 14% of these visits are downcoded. ESR 11 then exploited the fee change and used linear probability models with GP fixed effects to estimate the importance of the size of the incentive to upcode. Evidence shows that GPs upcode slightly less as the fee increases but only in the smallest distance bands that have the lowest value to upcode. The findings show an increase in the prevalence of upcoding in the furthest distance band, which happens to be one of the more valuable home visits to upcode. In conclusion, only a small change in gaming behavior was observed when faced with an increased financial incentive to do so, which is a reassuring result for policy makers.
O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Going the extra mile? Physicians' upcoding of fees for home visits. [Manuscript submitted for publication].

2.5. WP 5 Research cluster "Acceptability"

PhD 12: Societal value of health and well-being gains

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

PhD 13: Economic shocks, subjective well-being, and adaption

PhD 14: Impact of economic crisis on health, quality of care, and demand

PhD 15: The formation of reference points in decision making

The clusters' objectives achieved are as follows:

In the initial project phase, all ESRs participating in WP 5 performed comprehensive reviews for their respective PhD topics. The reviews were used as the basis for the definition of analytic models and data needs for empirical papers or were included in stand-alone review papers. In the next step, all of the study authors obtained and prepared data from, among others, our cooperation partners (Table 5) and developed appropriate econometric models for their research questions. In the final phase of the ETN, the ESRs wrote up their findings and drew out implications when presenting their results in scientific publications and at international conferences. In February 2020, a pan-European project studying COVID-19 was initiated in cooperation among ESR 13, ESR 14, and ESR 15 to start the ECOS. In total, 24 research papers (RPs) were written in the research cluster "Acceptability." In the following, please find the overview of RPs carried out in WP 5 from each of the study authors (the research papers on COVID-19 are described in the PhD topic of the first author).

The datasets in WP 5 that the ESRs have exploited are as follows:

ESR Nr.	Dataset
ESR 12	Self-collected data, German Socio-Economic Panel (SOEP)
ESR 13	Self-collected data, Avon Longitudinal Study of Parents and Children (UK)
ESR 14	Self-collected data, individual-level DRG data, and hospital-level financial data from Administração Central do Sistema de Saúde (ACSS)
ESR 15	Self-collected data, data from the "Well-being Study" from the Erasmus Universiteit Rotterdam

Table 5: Datasets in WP 5

ESR 12: Societal value of health and well-being gains. Research papers 2017-2020

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 1: PhD topic 12 revolves around questions of how to measure and weight health gains based on generic quality of life instruments and how to obtain monetary estimates for the value of health and well-being. Both aspects are important for determining whether the costs/prices of medical interventions are acceptable, given certain net health/well-being gains, as measured in health economics evaluations. In the first paper of ESR 12, a utility tariff for the ICECAP-O based on experienced utility was developed and compared with existing decision utility tariffs. The ICECAP-O and the ICECAP-A are validated multidimensional quality of life instruments. For use in economic evaluations, multiattribute instruments require utility weighting of health or well-being states. These weights are usually obtained through ex ante preference elicitation, that is, decision utility. The valuation of well-being states could also be based on experienced utility. Data from two cross-sectional samples corresponding to the target groups of ICECAP-O and ICECAP-A were used in two separate analyses. The utility impacts of the ICECAP-O and ICECAP-A levels were assessed through regression models using a compound measure of subjective well-being as a proxy for experienced utility. The calculated utility values are similar to the decision utility weights in some of the ICECAP dimensions and deviate in others. Smaller differences were found for the ICECAP-0 value sets than for those of the ICECAP-A. The approach generated alternative value sets for the ICECAP measures based on experienced utility, which could provide additional information in health economics evaluations.
Himmler, S., van Exel, J., & Brouwer, W. (2020). Happy with Your Capabilities? Valuing ICECAP-O and ICECAP-A States Based on Experienced Utility Using Subjective Well-Being Data. Medical Decision Making, 40(4), 498-510.

RP 2-RP 3: The second paper of ESR 12 used a stated preference contingent valuation experiment to estimate people's willingness to pay for health safety because of an

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

early warning system for infectious diseases in six European countries. The contingent valuation experiment was conducted through online questionnaires administered in February to March 2018 to cross-sectional representative samples in the UK, Denmark, Germany, Hungary, Italy, and the Netherlands, yielding a total sample size of 3,140. The central WTP task asked respondents for their monthly WTP to establish and maintain an early warning system for infectious diseases, increasing their health safety. Excluding protest answers and outliers (with a WTP exceeding 5% of income), the elicited overall mean monthly WTP per household was €21.80 (median = €10.00). This value ranged from €8.89 (median = €3.85) in Hungary to €28.33 (median = €13.42) in Denmark. Differences between countries can partly be explained by the variation in purchasing power, Hofstede's cultural dimensions, and trust in public institutions. In general, the results indicated that the majority of respondents see a certain value in the early warning system and would not oppose public funding. In light of the recent events relating to the coronavirus, ESR 12 and collaborators repeated the experiment during the first wave of the COVID-19 outbreak to investigate the impact of the pandemic on the willingness to pay for a warning system for infectious diseases. Differences between countries and the two time points (2018 and 2020) were analyzed. The results indicate that, overall, the mean WTP increased by approximately 50%, with large differences across countries.

Himmler, S., van Exel, J., Perry-Duxbury, M. et al. *(2020). Willingness to pay for an early warning system for infectious diseases. European Journal of Health Economics, 21, 763-773.*

Himmler, S., van Exel, J., & Brouwer, W. Did the COVID-19 pandemic change the willingness to pay for an early warning system for infectious diseases in Europe? [Manuscript submitted for publication].

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 4: The fourth paper of ESR 12 aimed to estimate the monetary value of health and broader well-being. Quality of life measures going beyond health, such as the ICECAP-A, are gaining importance in health technology assessments. The assessment of the monetary value of gains in this broader quality of life is needed to use these measurements in a cost-effectiveness framework. ESR 12 applied the well-being valuation approach to calculate the first monetary value for capability well-being in comparison to health, derived by ICECAP-A and EQ-5D-5L, respectively. Data from an online survey administered in February 2018 to a representative sample of UK citizens aged 18 to 65 were used (N=1,512). To overcome the endogeneity of income, we applied an instrumental variable regression. Several alternative model specifications were calculated to test the robustness of the results. The base case empirical estimate for the implied monetary value of a year in full capability well-being was £66,597. The estimate of the monetary value of a QALY obtained from the same sample and using the same methodology amounted to £30,786, which compares well with previous estimates from the willingness to pay literature. Throughout the conducted robustness checks, the value of capability well-being was found to be between 1.7 and 2.6 times larger than the value of health. Although the applied approach is not without limitations, the generated insights, especially concerning the relative magnitude of the valuations, may be useful for decision makers who need to decide based on economic evaluations using the ICECAP-A measure or, to a lesser extent, other (capability) well-being outcome measures. This may contribute to a more efficient allocation of health care resources.

Himmler, S., van Exel, J., & Brouwer, W. (2020). Estimating the monetary value of health and capability well-being applying the well-being valuation approach. European Journal of Health Economics, 21, 1235-1244.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 5: In the fifth research paper of ESR 12, data from the German Socioeconomic Panel (SOEP) were used to estimate the monetary value of a QALY in Germany based on well-being data. While starting out with just this aim, the research paper developed a detailed discussion of the well-being valuation approach and its usability for obtaining monetary valuations for health. As such, the study is relevant in many different countries with comparable panel datasets and may foster the use of the approach for estimating the monetary value of health across Europe.
Himmler, S., van Exel, J., Stöckel, J., & Brouwer, W. The Value of Health - Empirical issues in estimating the monetary value of a QALY based on well-being data. [Manuscript submitted for publication].

RP 6: In the sixth two-part research paper, ESR 12 aims to generate population weights for a generic global quality of life measure for the elderly, the well-being of older people (or WOOP) measure. Although the main study, which consists of a discrete choice experiment, is still ongoing with data collection finishing in December 2020, a prestudy was conducted and was accepted in 2020 at the Journal of Choice Modeling. The prestudy informed the researchers about the most appropriate method for the main study in terms of the cognitive burden of the survey respondents throughout the experiment.
Himmler, S., van Exel, J., Brouwer, W., & Soekhai, V. What works better for preference elicitation among older people? Assessing the cognitive burden of the discrete choice experiment and case 2 best-worst scaling. [Manuscript submitted for publication].

RP 7: The seventh research paper of ESR 12 aims to estimate an opportunity-cost-based cost-effectiveness threshold using mortality and hospital cost data from Germany. Insights from this paper are applicable to other (European) countries as well, given that this study will further refine the method. The results inform us about how much

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Germany is currently spending per health gain, which again may become relevant for assessing the cost/benefit ratio that would be acceptable for new medical interventions in the future.
The title of the working paper is:
Himmler, S. A cost-effectiveness threshold for Germany based on the marginal returns of hospital.

RP 8: Furthermore, ESR 12 is involved in a paper eliciting the preferences of Dutch policy makers for health care priority setting dimensions using a discrete choice experiment. In particular, the paper aims to investigate whether the availability of information on the level of profitability of a medical product would influence decisions on their reimbursement. Discrete choice data are currently analyzed. This research paper is a joint paper with the Dutch National Health Care Institute (ZINL) as part of an industrial secondment.
The title of the working paper is:
Himmler, S. Would the level of profitability of medical products influence reimbursement decisions? A discrete choice experiment in the Dutch policy context.

RP 9-RP 10: Although e-mental health interventions (eMHIs) offer certain advantages in terms of accessibility and flexibility, their acceptability among patients and therapists is still limited compared with face-to-face psychotherapy. As the second author, ESR 12 was part of two further papers that included discrete choice experiments surrounding the preferences of patients and psychotherapists regarding eMHIs and blended care.
Phillips, E., Himmler, S., & Schreyögg, J. (2021). Preferences for e-mental health interventions in Germany: A discrete choice experiment. Value in Health [Forthcoming].

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Phillips, E., Himmler, S., & Schreyögg, J. Preferences of psychotherapists for blended mental health interventions in Germany: A discrete choice experiment. [Manuscript submitted for publication].

ESR 13: Economic shocks, subjective well-being, and adaption. Research papers 2017-2020

RP 1-RP 4: In the first four papers on sleep in general, ESR 13 analyzed the prevalence and determinants of poor and insufficient sleep quantity in Italy's general population (RP 1), the relationship between the use of technology and social media on sleep latency among Italian adolescents (RP 2), the relationship between infant night wakings and parity progression in the UK (RP 3), and the impact of early sleep disruption on later cognitive outcomes in the UK (RP 4). Using survey and cohort data from Italy and the UK, respectively, in the first three research papers, ESR 13 used linear/logistic regressions to perform the analyses. For the fourth paper, cohort data from the UK were used to perform a life-course analysis and instrumental variable regression to investigate the role of cumulative episodes of sleep disruption on cognitive outcomes, including IQ and GCSE scores. For research papers on sleep, the study results suggest that the prevalence of insufficient sleep and poor sleep quality has increased over time in Italy, with elderly individuals, females, and respondents from poor socioeconomic backgrounds at a higher risk of having sleep problems (RP 1). Evidence shows that a higher frequency of use of technology and social media is related to sleep latency among adolescents (RP 2). Sleep disruption among parents also poses well-being issues that translate into reduced fertility intentions (RP 3), and sleep disruption among children is causally related to poor long-term cognitive outcomes (RP 4). Thus, the results of these research papers argue that more attention be paid to the importance of both sleep quality and noise-related policies in developing human

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

capital. Although sleep disruption can have cumulative effects on human capital outcomes, early interventions may offer the best option given the evidence of cheaper and higher returns from early investments.

Varghese, N.E., Lugo, A., Ghislandi, S., Colombo, P., Pacifici, R., & Gallus, S. (2020). Sleep dissatisfaction and insufficient sleep duration in the Italian population. Scientific Reports, 10(1), 17943.

Varghese, N.E., Santoro, E., Lugo, A., Madrid-Valero, J.J., Ghislandi, S., Torbica, A., & Gallus, S. (2020). The role of technology and social media use on sleep-onset difficulties among Italian adolescents: A cross-sectional study. Journal of Medical Internet Research [Forthcoming].

The titles of the working papers (RP 3-RP 4) are:

RP 3: *Varghese, N.E. & Ghislandi, S. Good night, sleep tight: Does infant sleep deprivation affect parity progression?*

RP 4: *Varghese, N.E. Timing and Scarring Effects of Childhood Sleep Deprivation. Do They Matter for Later Human Capital Formation?*

RP 5: In the fifth paper, Italian hospital discharge data for 2010-2015 were used to empirically investigate the causal effect of hospital closures on outcomes among AMI patients, including in-hospital mortality, length of stay and readmission rates, and possible mechanisms, including increased travel time and congestion. Using both a) a staggered DiD and b) DiD combined with the instrument variable (IV) estimation method, ESR 13 examined the impact at both the individual and municipality levels. ESR 13 found that hospital closures worsen health outcomes among AMI patients, including a higher risk of mortality and reduced readmission rates and length of stay. The results suggest that hospital closures increase the travel time needed and the congestion in remaining hospitals, which worsens patient outcomes. Moreover, extracting DiD estimates for each year showed that these negative effects are quite persistent. The

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

results are important for policy debates on the need for bailing out inefficient hospitals or the conditions under which to do so. Given the very low health spending per capita in Italy, the paper provides evidence for minimizing the risk of hospital closures.
The title of the working paper is:
Varghese, N.E., Ghislandi, S., Renner, A., & Scotti, B. Hospital closures and AMI Outcomes: Evidence from Italy.

RP 6-RP 7: In two papers in the ECOS, ESR 13 used descriptive statistics to observe the level of population compliance with WHO-recommended preventive measures and ordered logistic models to investigate the social and health disparities in public sentiments toward COVID-19. To investigate the sociodemographic and health determinants of public support and worries, odds ratios (ORs) were estimated using ordered logistic regression models, simultaneously controlling for potential confounders. Using pan-European data on WHO recommendations for preventive measures, ESR 13 showed that information from the WHO in the context of COVID-19 is well trusted and acted on by the public. Overall familiarity and adherence were quite high in most countries. Adherence was higher for social distancing recommendations than for hygiene measures. Familiarity and adherence were higher among older, female, and highly educated respondents. However, country-level heterogeneities were observed in the level of trust in information from the WHO, with countries severely affected by the pandemic reporting lower levels of trust. The results suggest the need to strengthen efforts to reach the less vulnerable parts of the population in information campaigns and to take into account the public's worries in the design and dissemination of risk communication strategies. The second paper shows that the elderly, female, and respondents from poor socioeconomic positions (SEPs) were more likely to support government containment policies. They were also more likely to be worried about issues, including loss of loved ones, overburdened hospital capacity,

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

economic crises, and food security. RP 7 highlights the socially patterned public response to the pandemic and calls attention to the issue of broad polarities in the societal response to exacerbate the prepandemic social and health inequalities in the population.

Sabat, I., Neumann-Böhme, S., Varghese, N.E., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. Risk Communication during COVID-19: Familiarity with, Adherence to and Trust in the WHO Preventive Measures. [Manuscript submitted for publication].

Varghese, N.E., Neumann-Böhme, S., Sabat, I., Torbica, A., Schreyögg, J., Stargardt, T., Barros, P.P., Brouwer, W., & van Exel, J. (2020). Social and Health disparities in Public Sentiments towards COVID-19: A Cross-Sectional study. [Manuscript submitted for publication].

Varghese, N.E., Sabat, I., Neumann-Böhme, S., Schreyögg, J., Stargardt, T., Torbica, A., van Exel, J., Barros, P.P., & Brouwer, W. Europeans know and act on WHO recommendations during COVID-19.

ESR 14: Impact of economic crisis on health, quality of care, and demand. Research papers 2017-2020

RP 1: In the first research paper, ESR 14 investigated hospital financial performance and quality of care in Portugal using hospital financial performance and patient-level diagnosis-related group (DRG) data provided by the Administraçao Central de Sistema de Saúde (ACSS) for the 2012-2017 period. ESR 14 hypothesized that changes in hospital financial performance did not immediately transform into changes in quality of care but, rather, had a gradual effect. Therefore, hospital financial performance was considered in period t and quality of patient outcomes in period t+1, and the partial adjustment mechanism was adopted. Hospital administrative data and hospital

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

financial reports were used to estimate the model. The models' estimations were conducted using a fixed effects approach. ESR 14 considered each of the quality of care and patient safety measures in separate multivariate regressions at the hospital level. The results of the study highlight that financially fragile hospitals need to be carefully monitored because financial hardship and poor management are likely to prompt problems with the quality of health care provision. Enforced cost-containment measures may drive hospitals to skimp on materials and staff, thereby negatively affecting the safety of patients undergoing surgical interventions. Traditionally used mortality rates may not reflect a deterioration in hospital care quality caused by financial pressure fast enough to enable effective problem targeting. Hence, the quality should be assessed additionally by measuring alternative indicators, in particular rates of adverse patient safety events.
The title of the working paper is:
Sabat, I. & Barros, P.P. Hospital Financial Performance and Quality of Care: Evidence from Portugal.

RP 2: The research paper, "Keeping the elderly safe: economic crisis and quality of care in Italy," aimed at analyzing the impact of adverse economic conditions on geriatric patients' safety and focused on elderly people who are the most frequent users of hospital care. ESR 14 modeled the relationship between the economic crisis and patient safety outcomes using a partial adjustment mechanism and dynamic panel data. In particular, generalized method of moments and fixed effect estimation techniques were used, and an analysis at a Sistema Locale del Lavoro (SLL) level was conducted. Understanding the relationship between adverse economic conditions and the health of vulnerable populations helps to design appropriate policy interventions to avoid detrimental impacts on the health outcomes of fragile populations.
The title of the working paper is:

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Sabat, I., Varghese, N.E., Barros, P.P., Ghislandi, S., & Torbica, A. Keeping the Elderly Safe: Economic Crisis and Quality of Care in Italy.

RP 3-RP 4: The third and fourth research papers in PhD topic 14 were carried out in the pan-European ECOS. To understand the public sentiment toward the measures used by policy makers for COVID-19 containment, a survey among representative samples of the population in seven European countries was carried out in the first two weeks of April 2020 (RP 3). The study addressed people's support for containment policies, worries about COVID-19 consequences, and trust in sources of information. Overall, citizens were satisfied with their government's response to the pandemic; however, the extent of approval differed across countries and policy measures. A north-south divide in public opinion was noticeable across the European states. The divide was particularly pronounced for intrusive policy measures, such as mobile data use for movement tracking, economic concerns, and trust in the information from the national government. Considerable differences in people's attitudes were noticed in countries, especially across individual regions and age groups. The findings suggest that the epidemic acts as a stressor, causing health and economic anxieties even in households that were not directly affected by the virus. At the same time, the burden of stress was unequally distributed across regions and age groups. In the next paper (RP 4), the link between the exposure to one of the information interventions on adherence to WHO hygiene and social behavior preventive recommendations was assessed using a logit model.

RP 3: Sabat, I., Neumann-Böhme, S., Varghese, N.E., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). United but divided: policy responses and people's perceptions in the EU during the COVID-19 outbreak. Health Policy, 124 (9), 909-918.

The title of the working paper is:

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

RP 4: Sabat, I., Varghese, N.E., Neumann-Böhme, S., Barros, P.P., van Exel, J., Torbica, A., Stargardt, T., Schreyögg, J., & Brouwer, W. Mastering the Art of Prevention: Communication, Adherence and Effectiveness in the time of COVID-19.

ESR 15: The formation of reference points in decision making. Research papers 2017-2020

RP 1: In the paper, "The role of domain-specific reference points in life satisfaction," of PhD topic 15, multiple discrepancies theory (MDT) was used to empirically investigate potential reference points for income and health that are associated with individuals' subjective well-being (SWB). SWB was measured in a representative sample (N=550) of the public in the Netherlands. The results suggest that SWB was most strongly associated with people's comparison of their income to their needs (self-needs) and their progression over time compared with past expectations (self-progress). For health, what they felt they deserved (self-deserve) and what people in their direct environment had (self-others) were associated with subjective well-being scale (SWLS). These discrepancies may function as reference points in SWB. This study suggests that multiple but different reference points for income and health are associated with subjective well-being scores. The findings indicate negative effects on life satisfaction if negative discrepancies exist between the status quo and domain-specific reference points. *Neumann-Böhme, S., Brouwer, W., van Exel, J. & Attema, A. I cannot get no... The role of domain-specific reference points in life satisfaction. [Manuscript submitted for publication].*

RP 2: To measure treatment acceptability, understanding if the use of different methods can lead to different results is very important. ESR 15 investigated the topic of preference reversals to determine whether coherence is higher among people with

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

domain expertise and through the use of simplified elicitation methods. One core assumption of standard economic theory is procedural invariance, meaning that individuals' preferences are stable irrespective of the method used to elicit them. Contrary to this preference, reversals may be observed when comparing different methods to elicit people's preferences, that is, choosing A over B with one method and preferring B over A using another. This poses a significant problem for theoretical and applied research. ESR 15 used a sample of medical and economics students (N=252) to investigate preference reversals in the health and financial domain when choosing for patients/clients. ESR 15 explored whether preference reversals are associated with domain experience and tested whether using guided "choice list" elicitation reduces reversals. The findings suggest that preference reversals were more likely to occur for medical students, in the health domain, and for open-ended valuation questions. Familiarity with a domain reduced the likelihood of preference reversals in that domain. Although preference reversals occur less frequently in specialist domains, they remain a significant theoretical and practical problem. The use of clearer valuation procedures offers a promising approach to reduce preference reversals.
Neumann-Böhme, S., Lipman, S.A., Brouwer, W., & Attema, A. Trust me; I know what I am doing. Does domain experience reduce preference reversals in decision making for others? [Manuscript submitted for publication].

RP 3: To measure the acceptability of a vaccine against COVID-19, data from the first wave of the pan-European study were used to estimate the willingness to get vaccinated against COVID-19 in seven European countries. In April 2020, 73.9% of 7664 participants from Denmark, France, Germany, Italy, Portugal, the Netherlands, and the United Kingdom stated that they would be willing to get vaccinated against COVID-19 if a vaccine was available. A further 18.9% of respondents stated that they were not sure, and 7.2% stated that they do not want to get vaccinated. Further analysis showed

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

that the willingness to get vaccinated differs considerably across genders and age groups. A significantly higher proportion of men were willing to get vaccinated (77.94%, chi-squared, $p < 0.001$) than women (70.15%). The willingness to be vaccinated is strongest among men older than age 55, whereas uncertainty ranged between 14 and 17% across all age groups. Males who were unwilling to get vaccinated tended to be younger, and 18-24-year-olds had the largest share, at 12%. Similarly, the trend for women who were unwilling to vaccinate also seems to follow the age categories. The uncertainty among women was higher in all age groups and for women between the ages of 45 and 54 (26%). Frequently given reasons for not wanting to be vaccinated or being unsure about it were caused by concerns over the potential side effects and safety of the vaccine.

Neumann-Böhme, S., Varghese, Sabat, I., N.E., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. European Journal of Health Economics, 21, 977-982.

RP 4: The fourth research paper, "How insurance status, audits, and fines affect physicians' treatment patterns: A systematic experimental analysis," investigates the treatment patterns of physicians of PhD topic 15. The theory of health care as a credence good is used as a basis to determine whether a relationship exists between insurance status and the quality of care that a patient receives. The effect of the different conditions on the treatment allocations for hypothetical patients with low and high severity conditions is investigated in an online experiment using a sample of medical students and physicians. Theoretical predictions based on the literature suggest that privately insured patients (fee for service) are more likely to be overtreated than patients with social health insurance (capitation). Information

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

asymmetries between physicians and patients, combined with the market incentives of the payment system, can lead to suboptimal treatment and reimbursement decisions. The title of the working paper is:
Neumann-Böhme, S., Wiesen, D., Attema, A., & Brouwer, W. How insurance status, audits, and fines affect physicians' treatment patterns: A systematic experimental analysis.

2.6. WP 6 Training

The curriculum of the ETN combined the skills and methodological knowledge of our consortium members with the experience of our partners into a single training program.

The clusters' objectives achieved are as follows:
The training program consisted of scientific courses in health economics and empirical methods (scientific courses) and courses for transferable competences and employability skills (soft skills courses). Scientific courses comprised 3 to 5 days, whereas soft-skills courses comprised 1 to 2 days. For our scientific courses, we differentiated among core courses, core electives, specializations, and electives. The ESRs participated in various courses from October 2017 to December 2018 at the institutions of the different beneficiaries. In total, each ESR attended 10 multidisciplinary research-related scientific courses (4 core courses, 3 core electives to be chosen among 2 alternatives each, 2 courses of the 3 specializations, and 1 elective course) and 8 courses for transferable competences and employability skills throughout the program.
The ETN training courses have been partly adapted from existing local PhD programs in economics (core courses), whereas all others were exclusively designed and offered for ESRs with a specialization in health economics. As beneficiaries opened their courses to

Marie Skłodowska-Curie Actions
Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

other locally managed PhD programs, ESRs of other programs also benefited from the increased supply of PhD courses.

We accompanied each course week at different locations with a rich social event program to engage networking among ESRs and supervisors to enable intercultural experiences and interinstitutional cooperation. In addition to the regular course program, we offered research-in-progress workshops jointly organized by two of the beneficiaries, at which all supervisors and all ESRs met together. Annual research-in-progress workshops gave ESRs the opportunity to bring soft and hard skills together to express and articulate themselves in a structured way and improve themselves through feedback. The first research-in-progress workshop took place in Rotterdam. The second research-in-progress workshop took place in Odense, and the third workshop initially planned in Milan was held online in April 2020 because of the COVID-19 pandemic. After each workshop, career counseling was offered by a professional external career counselor to reflect on each ESR's future career perspectives in research and practice. Please find the overview of the program in the following table.

Main Training Events	**Course characteristic**	**Date**	**Place**
Microeconomics I	Core	11.-13.10.2017	Lisbon
Microeconomics II	Core	16./18./20.10.2017	
Microeconometrics	Core	14.-16.11.2017	
Writing skills & intellectual property rights & research integrity	Soft skill	17.11.2017	
Project management & time- and self-management skills	Soft skill	20.11.2017	
Epidemiology and Economics	Core course	27.-30.11.2017	Milan
STATA	Core elective	10.-12.1.2018	Hamburg
SAS	Core elective	15.-17.1.2018	
Performance measurement a multilevel modeling	Core elective	18.-22.1.2018	
Panel Data	Core elective	23.-25.1.2018	
Experimental design	Core elective	19.-22.3.2018	Milan
Survey design and effectiveness research	Core elective	14.-16.5. 2018	Rotterdam

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Individual career counseling		17.-18.5.2018	
Research in progress workshop (2 days)		17.-18.5.2018	
Economic evaluation and quality of care	Specialization	22.-23.5.2018	
Measurement of quality of care in administrative data	Specialization	17.-19.9.2018	Hamburg
Measuring patient satisfaction	Specialization	20.-21.9.2018	
Risk adjustment methods for quality of care outcomes with administrative data	Specialization	24.-26.9.2018	
Communication and presentation skills	Soft skill	27.9.2018	
Funding opportunities & drafting a research proposal	Soft skill	14.1.2019	
Leadership- and team building training	Soft skill	15.1.2019	
Interpersonal and networking skills	Soft skill	16.1.2019	
Introduction into international health care systems analysis	Specialization	15.-24.5.2019	Odense
Inequality in health and health care			
Research in progress workshop (2 days)		27.-28.5.2019	Odense
Research in progress workshop (2 days) (online)		22.4.2020	online
Individual career counseling (online)		03.12.2020	online

Table 6: Overview of the ETN training program

The ETN program included academic secondments for all ESRs to other beneficiaries. These secondments were intended (a) for ESRs to benefit from methodological knowledge and/or the host's experience, (b) for ESRs to connect to their fellows and benefit from their experience, and (c) to encourage joint work between ESRs from different hosts. Secondments to beneficiaries offered opportunities to analyze data in the host institution and, thus, compare results across different health care systems and provide the opportunity for joint research papers. In addition, each ESR completed an internship at one of our industrial partners. ESR 8, who was hosted by our industrial beneficiary, had instead two secondments to scientific beneficiaries. These intersectoral secondments needed months to strengthen the transfer of research into practice and to increase the employability of ESRs in the industry after the program. Given the COVID-19 pandemic, many secondments in the last year of the ETN were canceled. In total, 14 academic secondments and 10 industrial secondments had taken

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

place. Please find more information in Table 7 on the secondments that were carried out.

Academic secondments		
ESR Nr.	**Institution**	**Duration (months)**
ESR 1	CHE	2
ESR 2	HCHE	2
ESR 3	CERGAS	cancelled due to COVID-19
ESR 4	CHE	2
ESR 5	CERGAS	4
ESR 6	ESHPM	6
ESR 7	CHE	1 (due to COVID-19)
ESR 8	HCHE	3
ESR 9	HCHE	2
ESR 10	CERGAS	4,5
ESR 11	CHE	3
ESR 12	DACHE	3
ESR 13	NOVA SBE	2
ESR 14	CERGAS	2
ESR 15	CHE	3
ESR 15	HCHE	3
Industrial secondments		
ESR Nr.	**Institution**	**Duration**
ESR 1	Novo Nordisk	4
ESR 2	DoHSC UK	cancelled due to COVID-19
ESR 3	UKE	5
ESR 4	NHS I	cancelled due to COVID-19
ESR 5	Danish Association of Regions	4
ESR 6	NHS P	4
ESR 7	TK	5
ESR 8	Abbott	ESR 8 was hosted by the industrial beneficiary Abbott and conducted 2 academic secondments
ESR 9	DoHSC UK	
ESR 10	WHO	cancelled due to COVID-19
ESR 11	RUGP	5
ESR 12	ZINL	5
ESR 13	CESAV	2
ESR 14	NHS P	2,5
ESR 15	UKE	2

Table 7: Secondments

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Evaluation of the ETN program

At the end of the ETN program, the ETN was evaluated to obtain feedback from the ESRs on their experiences with it. The possible answers for quantitative evaluation were “Excellent, Very good, Good, Fair, Poor.” The German grading system was used—1 was the best possible grade and 5 meant “not passed”—and was applied to the categories as follows: Excellent 1; Very good 2; Good 3; Fair 4; Poor 5. The figures were summed, and the sum was divided by the number of given answers to determine the average grade.

Name	Average Grade	Number of Evaluations
The ETN Program	1.5	12

Table 8: ETN evaluation

We also analyzed answers to open-ended questions from the ESRs to identify the potential for improvement. Analyzing qualitative data from open-ended survey questions involves a systematic process of identifying and making meaning from common themes and individual perspectives. Overall, the ESRs highly appreciated the opportunity to be part of the program, although some of them stated that the 3-year timeline was challenging. Please find an overview of the feedback from the ESRs as follows.

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Main themes	Comments of the ESRs
What did you like/dislike about the ETN project?	
Support of supervisors	"Supportive, productive but relaxed atmosphere with both, ESRs and supervisors…" "The ETN program allowed me to work on various projects with the support of excellent supervisors." " The supervisors provided me with valuable feedback (research in progress, academic secondment)"
Network	"…possibility to have an international network with PhDs and senior researchers; participation at international conferences (even as a visitor in case of nonacceptance was a fantastic opportunity)…" "…Cooperation with other ETN ESRs grew into the start of the pan-European project that studies public perceptions related to COVID-19 pandemic." "This ETN was for me the best imaginable way to do a PhD in Health Economics. We have a great network of PhD colleagues and supervisors…" "The people and exceptional opportunities for a PhD. I think there is a real willingness of people in our network to be helpful to each other going forwards." "I'm considering staying in academia, having a network like the ETN is a huge asset."
Reputation	"…the reputation: having been an ETN student is interesting and impressive for future employers"
Secondments	"It allowed me access to data and maybe gave ideas for the next project, depending on data availability" "…and secondment at the Ministry of Health let me have access to the patient-level data, so my first paper could be written. The academic secondment at Bocconi university let me get access to Italian patient level data, so my second paper could be written…" "Definitely a plus for my CV as it is my first experience of working in a governmental body." "Ability to work in an environment with people from different fields."

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

	"More connections and hence better job opportunities."
Training	"Quality of teaching, quality of network…" "Great training! The trainings helped to master the theoretical background…" "…soft skill classes would have been nicer in year 3 (to be able to get started with more research in the beginning, and because it is more needed shortly before the job search)…"
Conferences	"…ability to disseminate the work conducted in the best conferences."
International	"International experiences has widened by perspectives." "Very international atmosphere"
Lack of time	"…3 yrs. Very short time for a PhD including all the deliverables (conferences, traveling, secondment, courses): felt like running from one deadline to the next…" "I think a 4-year program would have been more realistic for most of us…"
Gratitude	"…Overall, a great opportunity! Thank you" "I had a great time and would not have wanted my PhD to look any differently." "Thanks so much for the great organization! These were 3 incredible years and I'm so happy to have been part of the ETN team."

Table 9: Qualitative feedback on the ETN program

2.7. WP 7 Dissemination

The impact of the ETN program is measured not only by the quality of the project results but also by the extent to which these results are known and used outside the network. Thus, the main goal of our dissemination and exploitation strategy was to spread projects' results to as many potential users as possible. The second goal was to contribute to the implementation and shaping of national and European health care policies and systems by informing future policy and practice. Using our dissemination

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

activities, we aimed to target the scientific community, health care practitioners, decision makers, and the general public at different project stages. Although we achieved all planned dissemination activities in the first three years, dissemination in the last year was affected by the COVID-19 regulation measures, and many events have been cancelled or shifted to the online format.

Nevertheless, we believe that our research activities, particularly the COVID-19-related research activities of ESRs 13, 14, and 15, have found strong international resonance in the press and public debates reaching millions of people in Europe. Please find below a summary of the IQCE communication and dissemination activities that we have undertaken in the project.

The clusters' objectives achieved are as follows:

2.7.1. Target group: scientific community

Conferences/Workshops

- **The IolaHESG (lowlands Health Economic Study Group) Conference 2018, May 23-24, Hoenderloo, the Netherlands:** Presentations of Sebastian Neumann-Böhme and Sebastian Himmler.
- **The GRASPH (Graduate School of Public Health) Summer School 2018, Odense, Denmark:** Presentation of Jamie O'Halloran.
- **The HCHE (Hamburg Centre for Health Economics) Center Day 2018, June 1, Hamburg, Germany:** Presentation of Anna-Katharina Böhm.
- **Applied Health Economics and Policy Evaluation workshop 2018, June, Paris, France**: Presentation of Laurie Rachet Jacquet.
- **The EuHEA (European Health Economics Association) Conference 2018, July 11-14, Maastricht, the Netherlands**: All fellows presented their research work at the Conference. Eleven fellows were accepted for oral presentations. Three fellows conducted poster presentations.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **The PhD Platform at the Erasmus Universiteit Rotterdam 2018, September 4, Rotterdam, the Netherlands:** Presentations of Sebastian Himmler and Sebastian Neumann-Böhme.
- **The EuHEA (European Health Economics Association) PhD Conference 2018, September 5-7, Catania, Sicily:** Presentations of Sebastian Himmler, Laurie Rachet Jacquet, Luis Cardoso Fernandes, and Iryna Sabat.
- **The PhD Workshop at the Universität Hamburg 2018, October 5-6, Lüneburg, Germany**: Presentations of Torsten Chandler, Anna-Katharina Böhm, Angela Meggiolaro, and Sara Jamalabadi.
- **The HESG (Health Economists' Study Group) Meeting 2019, January 7-9, York, Great Britain:** Presentations of Jamie O'Halloran, Laurie Rachet-Jacquet, and Luis Cardoso Fernandes.
- **The DERS Workshop at University of York 2019, February, York, Great Britain:** Presentation of Luis Cardoso Fernandes.
- **The DGGÖ (Die Deutsche Gesellschaft für Gesundheitsökonomie e.V.) Conference 2019, March 18-19, Augsburg, Germany:** Presentations of Sebastian Himmler, Sebastian Neumann-Böhme, and Anna-Katharina Böhm.
- **The GRASPH (Graduate School of Public Health) Summer School 2019, May 7-8, Korsør, Denmark:** Presentation of Ryan Pulleyblank.
- **The PhD Seminar at DACHE (Danish Center for Health Economics) 2019, May 20, Odense, Denmark:** Presentation of Sebastian Himmler.
- **The DIAL (Dynamics of Inequality across Life-Course) Conference 2019, June 6-8, Turku, Finland:** Presentation of Nirosha Elsem Varghese.
- **The AES (Spanish Health Economics Association) Conference 2019, June 12-14, Albacete, Spain:** Presentations of Iryna Sabat, Joana Pestana, and Nirosha Elsem Varghese.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **The AHEPE (Applied Health Economics and Policy Evaluation) 2019, June 20-21, Paris, France:** Presentation of Laurie Rachet-Jacquet.
- **The iHEA (International Health Economics Association) World Congress 2019, July 13-17, Basel, Switzerland:** Presentations of Sebastian Himmler, Ryan Pulleyblank, Jamie O'Halloran, Sebastian Neumann-Böhme, Laurie Rachet-Jacquet, Anna-Katharina Böhm, Luis Cardoso Fernandes, Iryna Sabat, Joana Pestana, Nirosha Elsem Varghese, Rucha Vadia, and Yuxi Wang.
- **Meeting at University of York 2019, July, York, Great Britain:** Presentation of Jamie O'Halloran.
- **The NHESG (Nordic Health Economics Study Group) Meeting 2019, August 21-23, Reykjavik, Iceland:** Presentations of Sebastian Himmler, Ryan Pulleyblank, Anna-Katharina Böhm, and Nirosha Elsem Varghese.
- **The NorDoc Meeting 2019, August 29-30, Aarhus, Denmark:** Presentation of Ryan Pulleyblank.
- **The EuHEA (European Health Economics Association) PhD Conference 2019, September 4-6, in Porto, Portugal:** Presentations of Ryan Pulleyblank, Jamie O'Halloran, Sebastian Neumann-Böhme, Iryna Sabat, and Joana Pestana.
- **The Interdisciplinary Conference "Defining the value of medical interventions" 2019, September 16-20, in Fürth/Nürnberg, Germany:** Presentation of Sebastian Himmler.
- **The DSSØ (Danish Society for Health Economics) Meeting 2019, September 23, in Odense, Denmark:** Presentation of Ryan Pulleyblank.
- **The APES CNES (Portuguese National Conference on Health Economics) 2019, October, in Lisbon, Portugal:** Presentation of Luis Cardoso Fernandes.
- **The National Conference on Health Economics 2019, October 16-18, in Lisbon, Portugal:** Presentations of Iryna Sabat and Joana Pestana.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **The ISPOR (International Society for Pharmacoeconomics and Outcomes Research) Europe Conference 2019, November 2-6, in Copenhagen, Denmark:** Presentation of Ryan Pulleyblank.
- **The ESE/ESHPM Meeting 2019, December 10, in Rotterdam, the Netherlands:** Presentation of Joana Pestana.
- **The HESG (Health Economists' Study Group) Meeting 2020, January 6-8, in Newcastle, Great Britain:** Presentation of Laurie Rachet-Jacquet.
- **The HCHE (Hamburg Centre for Health Economics) Center Day 2020, January 24, in Hamburg, Germany:** Presentation of Anna-Katharina Böhm**.**
- **Invited seminar at the University of Aberdeen and the HERU (Health Economics Research Unit) 2020, February, in Aberdeen, Scotland:** Presentation of Jamie O'Halloran.
- **The DGGÖ (Die Deutsche Gesellschaft für Gesundheitsökonomie e.V.) Conference 2020, March 23-24, in Wuppertal, Germany:** Presentations of Sebastian Neumann-Böhme, Rucha Vadia, and Torsten Chandler were accepted. However, the conference was cancelled because of the COVID-19 pandemic.
- **The ASHEcon (American Society of Health Economists Conference) 2020, June 8-9, virtual conference:** Presentations of Laurie Rachet-Jacquet and Luis Cardoso Fernandes.
- **The EuHEA (European Health Economics Association) Conference 2020, July 9, virtual conference:** Presentations of Sebastian Himmler, Ryan Pulleyblank, Sebastian Neumann-Böhme, Rucha Vadia, and Angela Meggiolaro.
- **The HCHE (Hamburg Centre for Health Economics) Center Day 2020, July 9, in Hamburg, Germany:** Presentation of Sebastian Neumann-Böhme.
- **The HEDG (Health, Econometrics and Data Group) Workshop 2020, in York, Great Britain:** Presentation of Laurie Rachet-Jacquet.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **The AIES (Italian Health Economics Association) Conference 2020, October 1-2, virtual conference:** Presentation of Yuxi Wang.
- **The World Congress on Public Health 2020, October 12-16, virtual conference:** Presentation of Iryna Sabat.
- **The PhD Workshop at the Universität Hamburg 2020, October 22-23,** virtual conference: Presentations of Anna-Katharina Böhm and Sara Jamalabadi.
- **The ISPOR (International Society for Pharmacoeconomics and Outcomes Research) Europe Conference 2020, November 16-19, virtual conference:** Presentations of Ryan Pulleyblank and Rucha Vadia.
- **The Research Group Meeting Economics at Nova SBE 2020, December, in Lisbon, Portugal:** Presentation of Joana Pestana.

Publications and working papers

Peer-reviewed publications (published or online-first)

- Böhm, A., Jensen, M.L., Sørensen, M.R., & Stargardt, T. (2020). Real-World Evidence of User Engagement with Mobile Health for Diabetes Management: Longitudinal Observational Study. *JMIR mHealth and uHealth*, 8(11), e22212.
- Chandler, T., Hiller, J., Peine, S., & Stargardt, T. (2019). Blood donation and donors: insights from a large German teaching hospital. *Vox sanguinis*, 115(1), 27-35.
- Wang, Y., Torbica, A., & Ghislandi, G. (2020). Investigating the Geographic Disparity in Quality of Care: The Case of Hospital Readmission after Acute Myocardial Infarction in Italy. *European Journal of Health Economics*, 21, 1149-1168.
- Wang, Y. & Fattore, G. (2020). The impact of the great economic crisis on mental health care in Italy. *European Journal of Health Economics*, 21, 1259-1272.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic Literature Review on the Spread of Health-related Misinformation on Social Media. *Social Science & Medicine*, 240, 112552.
- Jamalabadi, S., Winter, V., & Schreyögg, J. (2020). A Systematic Review of the Association between Hospital Cost/price and the Quality of Care. *Applied Health Economics and Health Policy*, 18, 625-639.
- Pulleyblank, R., Mellace, G., & Olsen, K.R. (2020). Evaluation of an Electronic Health Record System with a Disease Management Program and Health Care Treatment Costs for Danish Patients with Type 2 Diabetes. *JAMA Network Open*, 3(5), e206603.
- Vadia, R. & Stargardt, T. (2020). Impact of guidelines on the diffusion of medical technology: a case study of cardiac resynchronization therapy in the UK. *Applied Health Economics and Health Policy*.
- Himmler, S., van Exel, J., & Brouwer, W. (2020). Happy with Your Capabilities? Valuing ICECAP-O and ICECAP-A States Based on Experienced Utility Using Subjective Well-Being Data. *Medical Decision Making*, 40(4), 498-510.
- Himmler, S., van Exel, J., Perry-Duxbury, M. et al. (2020). Willingness to pay for an early warning system for infectious diseases. *European Journal of Health Economics*, 21, 763-773.
- Himmler, S., van Exel, J., & Brouwer, W. (2020). Estimating the monetary value of health and capability well-being applying the well-being valuation approach. European *Journal of Health Economics*, 21, 1235-1244.
- Varghese, N.E., Lugo, A., Ghislandi, S., Colombo, P., Pacifici, R., & Gallus, S. (2020). Sleep dissatisfaction and insufficient sleep duration in the Italian population. *Scientific Reports*, 10(1), 17943.
- Sabat, I., Neumann-Böhme, S., Varghese, N.E., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). United but divided: policy responses and

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

people's perceptions in the EU during the COVID-19 outbreak. *Health Policy*, 124 (9), 909-918.

- Neumann-Böhme, S., Varghese, N.E., Sabat, I., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *European Journal of Health Economics*, 21, 977-982.

Submitted manuscripts

- Böhm, A., Schneider, U., Aberle, J., & Stargardt, T. Regimen simplification and medication adherence: Fixed-dose versus loose-dose combination therapy for type 2 diabetes. [Manuscript submitted for publication].
- Böhm, A., Mohebbi, A., Tarp, J., Jensen, M., Bengtsson, H., & Morup, M. (2020). Early glycaemic control assessment based on consensus CGM metrics. [Manuscript submitted for publication].
- Chandler, T., Neumann-Böhme, S., Sabat, I., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., Torbica, A., & Stargardt, T. Blood donation in times of crisis: early insight into the impact of COVID-19 on blood donors and their motivation to donate across European countries. [Manuscript submitted for publication].
- Chandler, T., Clement, M., & Shehu, E. The impact of temporary deferrals on future blood donation behaviour across the donor life cycle. [Manuscript submitted for publication].
- Wang, Y., Castelli, A., Qi, C., & Liu, D. Assessing the Design of China's Complex Healthcare System - Concerns on Equity and Efficiency. [Manuscript submitted for publication].

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- Pulleyblank, R., Laudicella, M., & Olsen, K.R. Cost and quality impacts of treatment loci for type 2 diabetes patients with moderate disease severity: Hospital- vs. GP-based monitoring. [Manuscript submitted for publication].
- Rachet-Jacquet, L., Gutacker, N., & Siciliani, L. Scale economies in the health sector: The effect of hospital volume on health gains from hip replacement surgery. [Manuscript submitted for publication].
- Meggiolaro, A., Blankart, R., Stargardt, T., & Schreyögg, J. A methodological approach to aggregate multiple measures of hospital quality using variance-based weights. [Manuscript submitted for publication].
- O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Time to Retire? A register-based study of GPs' effort prior to retirement. [Manuscript submitted for publication].
- O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Home sweet home: Do physicians respond to fee changes for home visits? [Manuscript submitted for publication].
- O'Halloran, J., Oxholm, A., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Going the extra mile? Physicians' upcoding of fees for home visits. [Manuscript submitted for publication].
- Himmler, S., van Exel, J., & Brouwer, W. Did the COVID-19 pandemic change the willingness to pay for an early warning system for infectious diseases in Europe? [Manuscript submitted for publication].
- Himmler, S., van Exel, J., Stöckel, J., & Brouwer, W. The Value of Health - Empirical issues in estimating the monetary value of a QALY based on well-being data. [Manuscript submitted for publication].
- Himmler, S., van Exel, J., Brouwer, W., & Soekhai, V. What works better for preference elicitation among older people? Assessing cognitive burden of discrete

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

choice experiment and case 2 best-worst scaling. [Manuscript submitted for publication].

- Phillips, E., Himmler, S., & Schreyögg, J. (2021.) Preferences for e-mental health interventions in Germany: a discrete choice experiment. *Value in Health* [Forthcoming].
- Phillips, E., Himmler, S., & Schreyögg, J. Preferences of psychotherapists for blended mental health interventions in Germany: a discrete choice experiment. [Manuscript submitted for publication].
- Varghese, N.E., Santoro, E., Lugo, A., Madrid-Valero, J.J., Ghislandi, S., Torbica, A., & Gallus, S. (2020). The role of technology and social media use on sleep-onset difficulties among Italian adolescents: a cross-sectional study. *Journal of Medical Internet Research* [Forthcoming].
- Sabat, I., Neumann-Böhme, S., Varghese, N.E., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. Risk Communication during COVID-19: Familiarity with, Adherence to and Trust in the WHO Preventive Measures. [Manuscript submitted for publication].
- Varghese, N.E., Neumann-Böhme, S., Sabat, I., Torbica, A., Schreyögg, J., Stargardt, T., Barros, P.P., Brouwer, W., & van Exel, J. (2020). Social and Health disparities in Public Sentiments towards COVID-19: A Cross-Sectional study. [Manuscript submitted for publication].
- Neumann-Böhme, S., Brouwer, W., van Exel, J. & Attema, A. I cannot get no... The role of domain-specific reference points in life satisfaction. [Manuscript submitted for publication].
- Neumann-Böhme, S., Lipman, S.A., Brouwer, W., & Attema, A. Trust me; I know what I am doing. Does domain experience reduce preference reversals in decision making for others? [Manuscript submitted for publication].

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Working papers

- Böhm, A., Schneider, U., & Stargardt, T. The economics of fixed-dose combinations for diabetes: Does mode of drug administration impact health care spending?
- Böhm, A., Steiner, I., & Stargardt, T. Competition in off-patent biologic drug markets: A European comparison of competition induced price trends and market diffusion.
- Fernandes, L., Chalkley, M., & Gutacker, N. The influence of the clinical environment on physicians' treatment choices.
- Fernandes, L., Chalkley, M., & Gutacker, N. Time to Reform? The Effect of Winning Financial Awards on Consultant Activity in the English NHS.
- Fernandes, L., Chalkley, M., & Gutacker, N. 'Beg, Bargain and Borrow' – The Effect of Tapering Pension Earnings on Consultant Activity Rates in the English NHS.
- Chandler, T., Hiller, J., Peine, S., & Stargardt, T. A comparison of strategies to attract blood donors: an assessment of cost and benefit.
- Wang, Y. Hospital Quality and Patient Choice: Is There a Neighbourhood Effect?
- Pestana, J. & Barros, P. P. Measuring efficiency in the primary care management of chronic diseases, maternal and childcare.
- Pestana, J. & Barros, P.P. Impact of socio-economic conditions on the performance/quality indicators of the primary care units.
- Pestana, J., Attema, A., & Wiesen, D. Do performance-based incentives prompt "tunnel vision" behaviour? - A multitasking real-effort experiment.
- Jamalabadi, S., Bayindir, E.E., Schneider, U., & Schreyögg, J. The effect of hospital competition on patients outcomes - Insights from the German hospital market.
- Vadia, R. & Blankart, K. Regional innovation systems of medical technology: a cross-sectional analysis of cardiovascular research & funding.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- Vadia, R. & Stargardt, T. Cost-utility analysis of endovascular intervention in early-stage CLI patients.
- Rachet-Jacquet, L. The Effect of Surgeon Breaks on Patient Health Outcomes: Evidence from Hip Fracture Emergency Care.
- Rachet-Jacquet, L., Gaughan, J., Gutacker, N., & Siciliani, L. Does containing costs reduce hospital quality? The case of same-day discharge in the English National Health Service.
- Rachet-Jacquet, L., Gutacker, N. & Siciliani, L. The causal effect of hospital volume on health gains from hip replacement surgery.
- Meggiolaro, A., Semenova, A., & Schreyögg. J. Evaluating quality of stroke care in European countries: a systematic review.
- Meggiolaro, A., Torbica, A., Blankart, R., & Schreyögg, J. Comparing health care systems in Europe: a quality index approach based on hospitals' performance.
- Meggiolaro, A., Backhaus, I., Ognibeni, L., La Torre, G. et al. Economic Evaluation of non-malignant chronic pain treatment: unit cost analysis and patient level simulation.
- O'Halloran, J., Oxholm, A.S., Bjørnskov Pedersen, L., & Gyrd-Hansen, D. Can we pay soon-to-retire GPs to work more? An analysis of the effect of "goodwill payments" on GP behaviour.
- Himmler, S. A cost-effectiveness threshold for Germany based on the marginal returns of hospital.
- Himmler, S. Would the level of profitability of medical products influence reimbursement decisions? A discrete choice experiment in the Dutch policy context.
- Himmler, S. The monetary value of a QALY in Germany - Estimates based on the marginal returns of cardiovascular hospital spending.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- Himmler, S., Enzing, J., Knies, S., & Brouwer, W. A cost-effectiveness threshold for Germany based on the marginal returns of hospital.
- Varghese, N.E. & Ghislandi, S. Good night, sleep tight: Does infant sleep deprivation affect parity progression?
- Varghese, N.E. Timing and Scarring Effects of Childhood Sleep Deprivation. Do They Matter for Later Human Capital Formation?
- Varghese, N.E., Ghislandi, S., Renner, A., & Scotti, B. Hospital closures and AMI Outcomes: Evidence from Italy.
- Varghese, N.E., Sabat, I., Neumann-Böhme, S., Schreyögg, J., Stargardt, T., Torbica, A., van Exel, J., Barros, P.P., & Brouwer, W. (2020). Europeans know and act on WHO recommendations during COVID-19. *VoxEU*.
- Sabat, I. & Barros, P.P. Hospital Financial Performance and Quality of Care: Evidence from Portugal.
- Sabat, I., Varghese, N., Barros, P.P., Ghislandi, S., & Torbica, A. Keeping the Elderly Safe: Economic Crisis and Quality of Care in Italy.
- Sabat, I., Varghese, N.E., Neumann-Böhme, S., Barros, P.P., van Exel, J., Torbica, A., Stargardt, T., Schreyögg, J., & Brouwer, W. Mastering the Art of Prevention: Communication, Adherence and Effectiveness in the time of COVID-19.
- Neumann-Böhme, S., Wiesen, D., Attema, A., & Brouwer, W. How insurance status, audits, and fines affect physicians' treatment patterns: A systematic experimental analysis.

2.7.2 Target group: Health care practitioners and decision makers

Policy Briefs

- IQCE Policy Brief No. 1, October 2019: “Estimating a monetary value of health: why and how” by Sebastian Himmler

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- IQCE Policy Brief No. 2, November 2019: “The casual effect of hospital volume on health gains from hip replacement surgery” by Laurie Rachet Jacquet
- IQCE Policy Brief No. 3, December 2019: “Blood donation and donors: insights from a large German teaching hospital” by Torsten Chandler
- IQCE Policy Brief No. 4, February 2020: “Timing and scarring effects of early childhood sleep: do they matter for later human capital formation?” by Nirosha Varghese
- IQCE Policy Brief No. 5, April 2020: “The effect of the clinical environment on surgeons’ treatment choices” by Luis Fernandes
- IQCE Policy Brief No. 6, June 2020: “Impacts of an integrated electronic health record/disease management program for type 2 diabetes patients in Denmark” by Ryan Pulleyblank
- IQCE Policy Brief No. 7, July 2020: “The effect of hospital cost/price on quality of care” by Sara Jamalabadi
- IQCE Policy Brief No. 8, August 2020: “A methodological approach to aggregate multiple measures of hospital quality using variance-based weights” by Angela Meggiolaro
- IQCE Policy Brief No. 9, September 2020: “Policy responses and people’s perceptions during the COVID-19 pandemic” by Iryna Sabat
- IQCE Policy Brief No. 10, October 2020: “Investigating the geographic disparity in quality of care: the case of hospital readmission after acute myocardial infarction” by Yuxi Wang
- IQCE Policy Brief No. 11, November 2020: “Upcoding behavior of GPs and response to changes in value of upcoding” by Jamie O‘Halloran
- IQCE Policy Brief No. 12, December 2020: "Real-World evidence of user engagement with mobile health for diabetes management" by Anna-Katharina Böhm

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Events and selected other contributions

In addition to the conferences and internal events, our ESRs participated in a number of events targeted to health care practitioners to disseminate the findings of their research.

- **The Nova Health Care Initiative Meeting at Universidade Nova de Lisboa 2018, July 5, in Lisbon, Portugal:** Presentation of Iryna Sabat.
- **Danish Association of Regions, 2019, May 14:** Presentation of Ryan Pulleyblank.
- **The ACSS (Central Administration of the Health System) of Portuguese Ministry of Health, 2019, July 4, in Lisbon, Portugal:** Presentation of Iryna Sabat.
- **The ACSS (Central Administration of the Health System) of Portuguese Ministry of Health, 2019, September 24 in Lisbon, Portugal:** Presentation of Joana Pestana.
- **"Learnings to share," Department for Medical & Science, Department for Device R&D and Department for Data Analytics, Novo Nordisk A/S:** final results presentation in the series of talks of Anna-Katharina Böhm
- **University of Southern Denmark:** Guest lecture for data scientist students provided by Anna-Katharina Böhm.
- **IQCE Final Results Workshop 2020, September 28, virtual meeting.**
- **Mercator Roundtable on "Mit neuen Impfstoffen gegen COVID-19: Welche Herausforderungen liegen auf dem Weg zur Herdenimmunität?" 2020, November 10, virtual meeting**: Presentation of Sebastian Neumann-Böhme.
- **EUvsVirus hackathon 2020, November 24-26, virtual conference**: Volunteer work of Rucha Vadia.
- **HCHE Research Results live "Insights from the research on COVID-19" 2020, November 25, virtual meeting.**
- **The JESF (Journées des Économistes de la Santé Français) 2020, December 3-4, Brussells, Belgium:** Presentation of Laurie Rachet-Jacquet.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **“Qualitätsmanagement in der Gesundheitsversorgung” by the Medical Chamber Schleswig-Holstein 2020, December 16**: Sebastian Neumann-Böhme gave a talk about the health economics view of quality in health care.

Other contributions

- **Contribution to a book explaining a government program called “SNS + Proximidade.”** Available at: https://www.sns.gov.pt/sns-mais/sns-proximidade-sobre/. This is a modernization program of the NHS that encompasses several initiatives with the attempt to improve literacy and the patient centricity of the system. Fellow Joana Pestana reviewed the initial text and added some chapters with updated data and research insights.
- **Netfarma, 2018, November 28**: Opinion article of Joana Pestana “Já viu na sua Área do Cidadão?” on the digital transformation of the Portuguese NHS, the advantages and challenges of the patient portal developed by an NHS agency to promote more patient-centered care, and the integration of care services. Available at: https://www.netfarma.pt/ja-viu-na-sua-area-do-cidadao/
- **National Health Care Institute Netherlands (ZINL)**: Sebastian Himmler was working with the National Health Care Institute Netherlands (ZINL) on eliciting preferences for priority setting in health care and was creating a database for patient-reported outcomes suitable for precision and personalized medicine.
- **CHE's annual report 2018**: Luis Fernandes and Laurie Rachet Jacquet. Available at: https://www.york.ac.uk/media/che/documents/CHE_annual_report_2018.pdf
- **The European Health Parliament (an initiative by multiple healthcare stakeholders in Brussels) Committee – “Data for Healthy Societies,” 2018-2019:** Rucha Vadia served as a member of a Committee. She developed and disseminated policy recommendations to the EU commission for healthcare data-

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

related policies from 360-degree perspectives focusing on healthcare systems/providers, policy makers, and patients.

- **Eurohealth- WHO/Europe**, Wang, Y., McKee, M., Torbica, A. et al. (2019). Facts. Figures! Fiction? Eurohealth, 25 (3), 19-22.
- **An interdisciplinary symposium on "Defining the value of medical interventions" 2019**: Sebastian Himmler participated in this symposium and used it to create an anthology with the fellow drafting a chapter on "Estimating a monetary value of health: why and how." In his contribution, Sebastian Himmler outlines why it is necessary and ethically justified to conduct health economics evaluations and to express health in monetary terms. The anthology is currently in print (Schildman, J., Zerth, J. (eds.): Defining the Value of Medical Interventions. Normative and Empirical Challenges. Book in print).
- **Executive Summary 2019 OASI Report**: Observatory on Healthcare Organizations and Policies in Italy. CERGAS. Pulleyblank R, Longo F, Ricci A, Armeni P, Furnari A, Bobini M, Vagnarelli G.
- **Netfarma, 2019, April 20**: Opinion article of Joana Pestana "Melhorar a qualidade em saúde: Dicas para os autores" on tips for researchers working on improving the quality of health care. Available at: https://www.netfarma.pt/melhorar-a-qualidade-em-saude-dicas-para-os-autores/
- **Portuguese Health Economics Association Newsletter, 2020, March 31**: Opinion article of Joana Pestana and Francisca Lopes "Os 'novos' conceitos que contaminaram os nossos dias de quarentena" on the search trends for COVID-19-related terms. Available at: https://apes.pt/arquivo/1490
- **Portuguese Health Economics Association Newsletter, 2020, May 25**: Opinion article of Joana Pestana "Cuidados de saúde no #novonormal" on the use of telemedicine in Portugal. Available at: https://apes.pt/arquivo/1777

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **Dagens Medicin (Danish Newspaper), 2020, July 3**: Interview of Ryan Pulleyblank. Available at: https://dagensmedicin.dk/nyt-studie-praktiserende-laeger-er-billigere-og-lige-saa-gode-som-hospitalerne-til-at-behandle-diabetikere/.
- **Portuguese Health Economics Association Newsletter, 2020, July 7**: Opinion article of Joana Pestana "Uma vacina, esse bem público" on distribution and uptake of vaccines and COVID. Available at: https://apes.pt/arquivo/2064
- **Netfarma, 2020, October 15**: Opinion article of Joana Pestana "Para um bom comportamento (em saúde)" on behavioural economics in health care, and especially in the case of the COVID pandemic. Available at: https://www.netfarma.pt/para-um-bom-comportamento-em-saude
- **Centre for Health Economics External Newsletter No. 36, 2019, November**: Rachet Jacquet, L., Gutacker, N., & Siciliani, L. The causal effect of volume on health gains from hip replacement surgery: Evidence from England. Available at : https://www.york.ac.uk/media/che/documents/newsletters/November_19.pdf
- **EJPH supplement,** Sabat, I., Varghese, N.E., Neumann-Böhme, S., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J. & Stargardt, T. (2020). Countering COVID-19: A European survey on acceptability of and commitment to preventive measures, *European Journal of Public Health*, 30(5), ckaa166.619.
- **The research on COVID-19 in the ECOS** started in February 2020 was disseminated through numerous press releases, newspaper articles, interviews, events, and newsletters. Mentioning all of the research was beyond the scope of this report. Therefore, we can summarize that the ECOS received impressive international press coverage in Denmark, France, Germany, Italy, Portugal, the Netherlands, and the United Kingdom, reaching many millions of people in Europe.

Due to COVID-19 restrictions, the Final Results Workshop (FRW) took place online on September 28, 2020. The lead supervisors introduced the research topics covered in the

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

workshop, and the IQCE fellows described the highlights of their research in 10-minute presentations. The workshop consisted of five sessions reflecting five dimensions of quality of care defined by the World Health Organization (WHO): effectiveness, efficiency, access, acceptability, and equitability. The presentations of the fellows were accompanied by expert discussions. The following health care practitioners and experts discussed the presentations of the fellows and participated in the workshop:

- Dr. Eliana Barrenho, OECD
- Prof. Bruno Heleno, NHS, Nova Medical School
- Dr. Ron Kemp, Netherlands Authority for Consumers and Markets
- Dr. Saskia Knies, Healthcare Institute Netherlands
- Prof. Soren Kristensen, University of Southern Denmark and Imperial College
- Prof. Mauro Laudicella, University of Southern Denmark
- Alexandre Lourenço, NHS, Portuguese Association of Health Managers
- Dr. Mauro Percudani, Psychiatry Department, Niguarda Hospital
- Daniel Pinto, NHS, Nova Medical School

The workshop was recorded and made available on the ETNIQCE website at https://www.iqce.uni-hamburg.de/policy-dissemination/final-results-workshop-2020w.html and was distributed through IQCE social media. Furthermore, the link to the Final Results Workshop was distributed in e-mails, social media, and newsletters of the partner´s institutions to reach the largest possible audience. Please find below the workshop's agenda:

1. Introduction and short overview by Professor Dr. Jonas Schreyögg, Scientific Director IQCE, Hamburg Center for Health Economics
2. Session "Hospital Care"
    - Session introduction by Professor Luigi Siciliani
    - "The effect of hospital volume on health gains from hip replacement surgery" by Laurie Rachet Jacquet

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- "Comparing quality of care across health care systems" by Angela Meggiolaro
- "Hospital financial performance and quality of care: Evidence from Portugal" by Iryna Sabat
- Expert discussion by Professor Luigi Siciliani, University of York; Professor Soren Kristensen, University of Southern Denmark and Imperial College; Dr. Eliana Barrenho, OECD

3. Session "Primary Care"
    - Session introduction by Professor Pedro Pita Barros
    - "Going the extra mile? Physicians' upcoding of fees for home visits" by Jamie O'Halloran
    - "Improving quality of care by increasing adherence to treatment" by Anna-Katharina Böhm
    - "Measuring efficiency in the primary care management of chronic diseases, maternal and childcare" by Joana Pestana
    - Expert discussion by Professor Pedro Pita Barros, Universidade Nova de Lisboa; Professor Bruno Heleno, NHS, Nova Medical School; Daniel Pinto, NHS, Nova Medical School; Alexandre Lourenço, NHS, Portuguese Association of Health Managers
4. Session "Behavioral Incentives"
    - Session introduction by Professor Kim Rose Olsen
    - "The impact of the clinical environment on surgeons' treatment choices" by Luis Fernandes
    - "Evaluation of an electronic health record system with a disease management program and health care treatment costs for Danish patients with type 2 diabetes" by Ryan Pulleyblank
    - "A comparison of strategies to attract blood donors: An assessment of cost and benefit" by Torsten Chandler

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- Expert discussion by Professor Kim Rose Olsen and Professor Mauro Laudicella, University of Southern Denmark

5. Session “Geographic & Socioeconomic variation”
    - Session introduction by Professor Giovanni Fattore
    - “The impact of the great economic crisis on mental health care in Italy” by Yuxi Wang
    - “Hospital factors affecting quality of patient care” by Sara Jamalabadi
    - “Regional Innovation Systems (RIS) of medical technologies - a cross sectional analysis of knowledge production for cardiovascular devices in Europe” by Rucha Vadia
    - Expert discussion on the paper by Yuxi Wang by Dr. Mauro Percudani, Psychiatry Department, Niguarda Hospital
    - Expert discussion on the papers by Sara Jamalabadi and Rucha Vadiaby Professor Giovanni Fattore, Bocconi University
6. Session “Wellbeing and health”
    - Session introduction by Professor Dr. Arthur Attema
    - “I can’t get no... The role of domain-specific reference points in life satisfaction” by Sebastian Neumann-Böhme
    - “Estimating the monetary value of a QALY in Germany” by Sebastian Himmler
    - “Hospital closure and AMI outcomes: Evidence from Italy” by Nirosha Elsem Varghese
    - Expert discussion by Professor Dr. Arthur Attema, Erasmus University Rotterdam; Dr. Saskia Knies, Healthcare Institute Netherlands; Dr. Ron Kemp, Netherlands Authority for Consumers and Markets

Marie Skłodowska-Curie Actions

Funded by the European Union’s EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

2.7.3. Target group: General public

In addition to the dissemination and exploitation of the project results in academia and practice, we also conducted information, promotion, and dissemination activities to raise awareness and enhance the visibility of the project in the general public.

Visual communication

- **Six video interviews with fellows at the beginning of the project, October 2017:** We conducted six video interviews with six fellows to share their motivations and expectations on the ETN at the beginning of the project. We disseminated the videos through our website, newsletters, and social media channels. The videos are available on, among others, the ETN IQCE YouTube channel https://www.youtube.com/channel/UCZ1g34S30fHtC5-LtORP 4lg/.
- **Six video interviews with fellows in the middle phase of the project, May 2019:** We conducted six video interviews with the fellows about their research progress and experiences in the ETN program. We disseminated the videos through our website, newsletters, and social media channels. The videos are available on, among others, the ETN IQCE YouTube channel https://www.youtube.com/channel/UCZ1g34S30fHtC5-LtORP 4lg/.
- **ETN IQCE Image Film 2020:** We developed a short image film with professional support from the media team of the University of Hamburg, and it features four ETN fellows presenting their research and reflections on the ETN. The film is available on the ETN IQCE YouTube channel https://www.youtube.com/channel/UCZ1g34S30fHtC5-LtORP 4lg/, the project website, and other social media channels.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Online communication and dissemination

- **Website 2017 & Website Redesign 2018: 2017,** we created the http://www.iqce.eu website. In 2018, we considered the feedback we obtained from our stakeholders and redesigned our website according to it.
- **Newsletters:** News about IQCE appeared regularly in newsletters of the Economics Faculty of the University of Hamburg, in the newsletter of Hamburg Center of Health economics, and in the newsletters of CERGAS, Bocconi University.
- **Social Media:** The IQCE was active on all common social media channels, including Facebook, LinkedIn, and Twitter. IQCE students also blogged about all of their program's stations on the IQCE blog.

Social Media Channel	Since	Posts and Followers (12/2020)
ETN IQCE ON FACEBOOK https://www.facebook.com/etniqce	November 2017	**Followers:** 71 **Posts:** 78
ETN IQCE ON LinkedIN https://www.linkedin.com/company/27107489	November 2017	**Followers:** 64 **Posts:** 78
ETN IQCE ON TWITTER https://twitter.com/ETN_IQCE?lang=de	November 2017	**Followers:** 94 **Posts:** 78
ETN IQCE STUDENT'S BLOG http://iqce.blogs.uni-hamburg.de	December 2017	**Posts:** 12
ETN IQCE ON YOUTUBE	July 2019	**Followers:** 3 **Posts:** 34

Table 10: Social media channels

Events and other contributions

- **Night of Knowledge 2017, November 4, in Hamburg, Germany,** IQCE booth.
- **Improving Quality of Care in Europe (IQCE) European Training Network: Doctoral candidates want to improve healthcare, 2018, February 23,** an interview with

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Angela Meggiolaro about the ETN was published in the Hamburg University Magazine: https://www.uni-hamburg.de/en/newsroom/forschung/2018-02-23-etn-gesundheitsforschung.html.

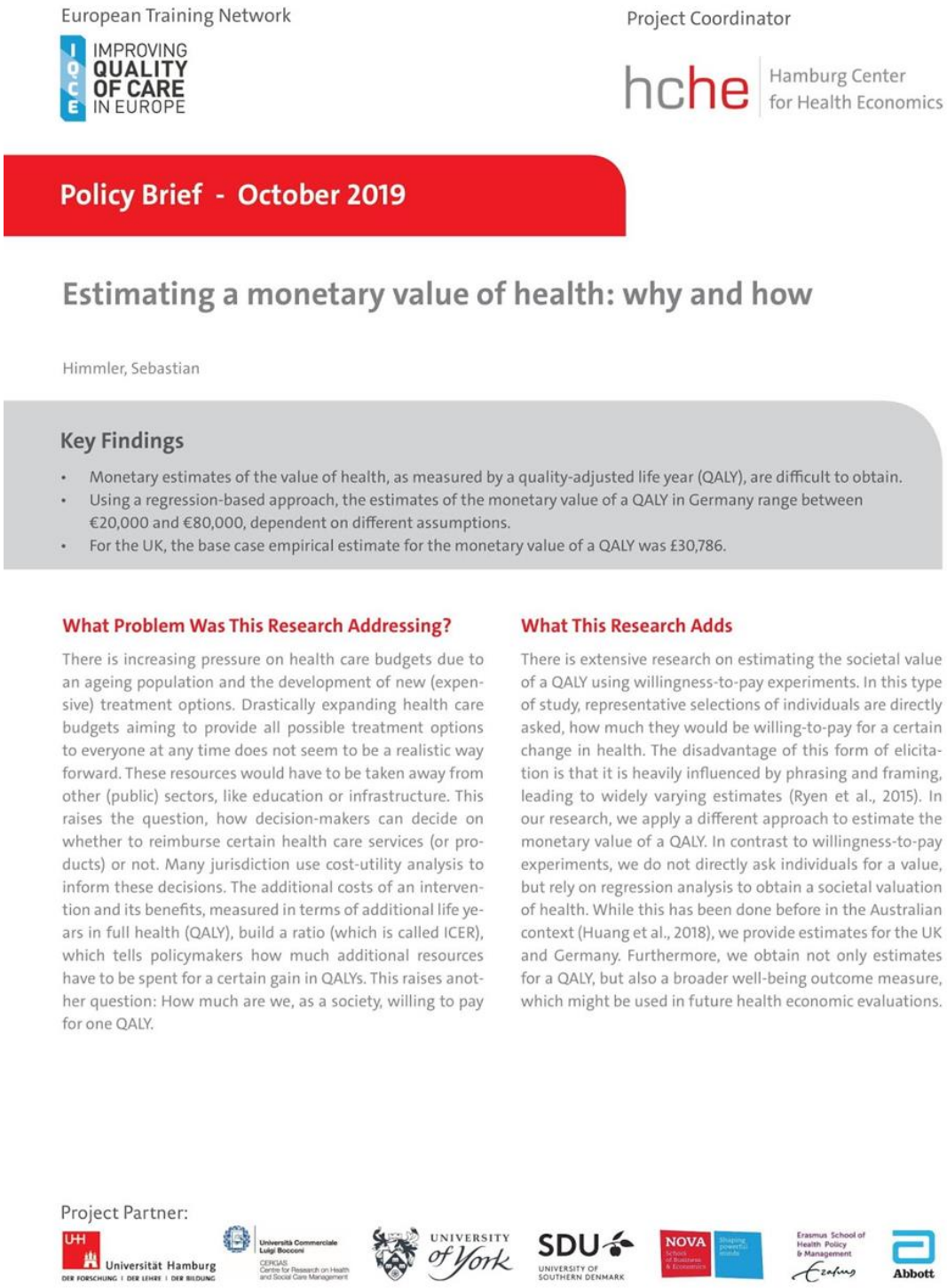
- **The 10th DGGÖ annual meeting, 2018, March 5-6, in Hamburg, Germany:** IQCE booth.
- **The European Researcher Night 2018, September 28, in Lisbon, Portugal:** Presentation of Pedro Pita Barros, scientific supervisor of the IQCE program.
- **The European Researcher Night 2018, September 29, in Milan, Italy:** Presentation of Aleksandra Torbica, scientific supervisor of the IQCE program.
- **Hamburg's Summer of Knowledge 2019, June 20, in Hamburg, Germany:** IQCE booth with Torsten Chandler and Sara Jamalabadi.
- **HCHE Research Results live "Insights from the research on COVID-19" 2020, November 25, virtual meeting,** Presentation of Jonas Schreyögg, scientific director of the IQCE program.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

ANNEX: ETN IQCE POLICY BRIEFS

- **IQCE Policy Brief No. 1, October 2019: "Estimating a monetary value of health: why and how" by Sebastian Himmler**



European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - October 2019

Estimating a monetary value of health: why and how

Himmler, Sebastian

Key Findings

- Monetary estimates of the value of health, as measured by a quality-adjusted life year (QALY), are difficult to obtain.
- Using a regression-based approach, the estimates of the monetary value of a QALY in Germany range between €20,000 and €80,000, dependent on different assumptions.
- For the UK, the base case empirical estimate for the monetary value of a QALY was £30,786.

What Problem Was This Research Addressing?

There is increasing pressure on health care budgets due to an ageing population and the development of new (expensive) treatment options. Drastically expanding health care budgets aiming to provide all possible treatment options to everyone at any time does not seem to be a realistic way forward. These resources would have to be taken away from other (public) sectors, like education or infrastructure. This raises the question, how decision-makers can decide on whether to reimburse certain health care services (or products) or not. Many jurisdiction use cost-utility analysis to inform these decisions. The additional costs of an intervention and its benefits, measured in terms of additional life years in full health (QALY), build a ratio (which is called ICER), which tells policymakers how much additional resources have to be spent for a certain gain in QALYs. This raises another question: How much are we, as a society, willing to pay for one QALY.

What This Research Adds

There is extensive research on estimating the societal value of a QALY using willingness-to-pay experiments. In this type of study, representative selections of individuals are directly asked, how much they would be willing-to-pay for a certain change in health. The disadvantage of this form of elicitation is that it is heavily influenced by phrasing and framing, leading to widely varying estimates (Ryen et al., 2015). In our research, we apply a different approach to estimate the monetary value of a QALY. In contrast to willingness-to-pay experiments, we do not directly ask individuals for a value, but rely on regression analysis to obtain a societal valuation of health. While this has been done before in the Australian context (Huang et al., 2018), we provide estimates for the UK and Germany. Furthermore, we obtain not only estimates for a QALY, but also a broader well-being outcome measure, which might be used in future health economic evaluations.

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG · Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management · University of York · SDU University of Southern Denmark · NOVA School of Business & Economics · Erasmus School of Health Policy & Management · Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Methods

The applied methodology and the corresponding econometric models are known as „well-being valuation approach", which consists of two main elements. First, using regression techniques based on survey data, the impact of a change of income and health on overall life satisfaction is estimated. Second, the monetary value of health is calculated based on the marginal rate of substitution between health and in come. In other words, this approach statistically estimates the average change in income necessary so that life satisfaction remains constant after a certain hypothetical change in health. That is why the obtained monetary value is also called compensating income variation.

For estimating the monetary value of health in Germany, we used longitudinal data from 32,832 individuals obtained from the German Socio-Economic Panel spanning from the year 2002 to 2016. The calculations for the UK were conducted based on a cross-sectional sample using an online survey administered in February 2018 with 1,512 individuals.
and aligned with those used by DOMAINE, a European wide project (Donor management in Europe) [1].

Policy Relevance of Research

- Estimates of the societal monetary valuation of health are relevant for deciding whether certain health care services should be reimbursed or not
- The ratio of additional costs and benefits of a medical innovation has to be compared to a certain threshold, which is often oriented on the value society attaches to health
- The estimates provided by this research inform such a threshold for both the UK and Germany
- By also providing a threshold estimate for a broader well-being outcome, we also inform decisions about interventions aimed at not merely improving health

Research Findings

As is common using this type of approach, the estimates depend on how the statistical models are specified. The specifications itself depend on the assumptions. Using the least parsimonious set of assumptions, the estimate for the monetary value of a QALY in Germany was €78,871. This value corresponds to the average amount of additional income that an individual has to be compensated with to remain on the same level of life satisfaction if their health stock is change by one QALY. In a more parsimonious model, which tries to overcome difficulties in measuring the causal impact of income on life satisfaction, the value was €22,683. Several other model specifications were estimated to test the sensitivity of estimates, with the bulk of values lying between €20,000-80,000.

For the UK, the base case empirical estimate for the monetary value of a QALY was £30,786, which compares well to previous estimates from the willingness to pay literature. The monetary value of a year in full capability well-being, the examined broader well-being measure, obtained from the same sample and using the same methodology amounted to £66,597. Throughout the conducted robustness checks, the value of capability well-being was consistently found to be about twice as high as that of health.

References

1. Ryen L, Svensson M. The Willingness to Pay for a Quality Adjusted Life Year: A Review of the Empirical Literature. Health Econ. 2015;24(10):1289-1301.
2. Huang L, Frijters P, Dalziel K, Clarke P. Life satisfaction , QALYs , and the monetary value of health. Soc Sci Med. 2018;211(June):131-136.
3. Brouwer W, van Baal P, van Exel J, Versteegh M. When is it too expensive? Cost-effectiveness thresholds and health care decision-making. Eur J Heal Econ. 2019;20(2):175-180.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 2, November 2019: "The casual effect of hospital volume on health gains from hip replacement surgery" by Laurie Rachet Jacquet**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - November 2019

The causal effect of hospital volume on health gains from hip replacement surgery

Rachet Jacquet

Key Findings

- Hospital volume does not have a causal impact on hip-specific patient-reported health outcomes for planned primary hip replacements in the English NHS.
- The clinically small and positive volume-outcome correlation disappears once we adjust for the confounding effect of hospitals' quality reputation on volume (volume endogeneity).

What Problem Was This Research Addressing?

This research aims to understand whether increasing hospital volumes has a positive effect on health outcomes in the context of planned hip replacement using administrative hospital data in England. Despite evidence of a positive correlation between volumes and outcomes, there is little evidence to date on the causal mechanisms at play. A difficulty in estimating causal effects comes from the fact that volumes may also be determined by hospitals' reputation. High-quality hospitals will also attract more patients, and thus have higher volumes. This study investigates the causal effect of hospital volume on the health gains of patients receiving a planned hip replacement procedure in the English National Health Service (NHS) in 2015/16. Volumes are calculated using hospitals' yearly hip patient population. Patients' health gains are measured with patient-reported measures of hip-related functional status, pain and quality of life, shortly before and 6-month after surgery.

What This Research Adds

This research contributes to the existing literature on volume-outcome relationship in several ways. First, we use patient-reported outcome measures (PROMs) to capture the effect of hospital volume in terms of improvements in patients' health status. Hip-specific patient-reported health measures provide a relevant measure of quality from a patient perspective and capture fine variations in health outcomes. Second, the availability of rich patient-reported data on functional status collected just before the surgery ensures that we thoroughly control for differences in patient case-mix across hospitals, which would otherwise confound our estimates. Third, we obtain causal estimates of the effect of hospital volume on health outcomes, by employing a measure of predicted volumes rather than the observed volumes to account for the confounding effect of hospitals' reputation on volumes. This methodology can be applied to a variety of institutional settings and procedures.

Methods

We investigate the effect of hospital volume on health outcomes by regressing patients' post-surgical health status on hospitals' yearly volumes in an Ordinary Least Squares regression. We use a set of dummy variables corresponding to categories of volumes, to allow for potential decreasing marginal returns to scale on outcomes. The model specification includes controls for patient characteristics (age, gender, comorbidities, pre-surgery health status and socio-economic status) and hospital characteristics (hospital status).

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Low (high) quality hospitals will face a lower (higher) demand, thus inducing a positive correlation in estimates of the effect of volume on outcomes (i.e. volume endogeneity). To address this, we use a patient choice model of hospitals where we predict which hospital would patients choose, mainly based on patient's distance to the hospital. This amounts to constructing the hospital volumes that would be observed if patients were choosing hospitals based on proximity, and abstracting from quality reputations. In our regression, observed hospital volumes are replaced by the predicted volumes, to investigate the causal effect of volume on outcomes. The first set of results using observed volumes suggest a positive association, while results with predicted volumes isolate the causal relationship running from hospital volume to health outcomes.

Research Findings

Results with observed hospital volumes indicate a positive effect of hospital volumes on health outcomes, for patients treated in hospitals of 200 hip replacements cases a year or more, compared to hospitals with lower hip patient volume. The estimated association is however quantitatively small, as it accounts for less than one-fourth of a clinically meaningful change in hip-specific patient-reported outcome measure. The volume coefficients for the predicted hospital volumes are smaller and no longer statistically significant despite precise estimation. This suggests that hospitals with higher quality attract more patients, thus creating a spurious positive relation between health outcomes and volumes. After accounting for reverse causality, hospital volumes are no longer associated with improved health outcomes. Figures 1 and 2 provide a graphical intuition of our results. In a sensitivity analysis, we include surgeon volume and characteristics to ensure that surgeon effects are not driving our results at the hospital level. Results are unchanged, and show that predicted hospital volume has no effect on health gains even after controlling for surgeon volume. Figure 1 shows that the positive correlation between post-surgery health and observed volumes (correlation coefficient r=0.33) reduces when we adjust for pre-surgery health (r=0.10). Using predicted volumes further reduces the positive volume-outcome correlation (Figure 2, r=0.07) and regression results are no longer statistically significant. These figures offer a graphical representation of the importance of adjusting for patient severity and volume endogeneity. In conclusion, we find no causal effect of hospital volume on health gains from planned hip replacement in England, after accounting for the endogeneity of hospital volumes.

Policy Relevance of Research

- Planned hip replacement patients represent 70,000 cases annually in England.
- Concentrating the provision of planned hip replacements in the English NHS would not result in better health outcomes, and may have adverse effects on patient access to care.
- The causal effect of volume on outcomes needs to be isolated from the effect of hospitals' quality reputation on volumes.

Figure 1. Observed volumes and post-surgery health (left), and health gains (right)

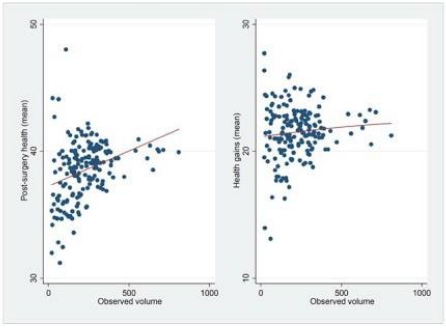
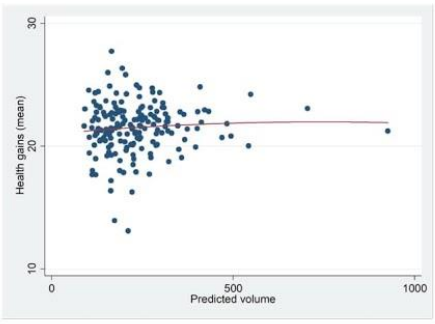


Figure 2. Predicted volumes and health gains



References

1. Rachet Jacquet, L., Gutacker N. and Siciliani, L. (2019). 'The causal effect of hospital volume on health gains from hip replacement surgery' CHE Research Paper, no. 168, Centre for Health Economics, University of York, York, UK.
2. Sheldon, T. A. (2004). The volume-quality relationship: insufficient evidence for use as a quality indicator. Quality and Safety in Health Care, 13(5), 325.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 3, December 2019: "Blood donation and donors: insights from a large German teaching hospital" by Torsten Chandler**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - Dezember 2019

Blood donation and donors: insights from a large German teaching hospital

Chandler, Torsten[1] Hiller, Jens[2] Peine, Sven[2] Stargardt, Tom[1]

Key Findings

- In line with other regions in Germany, the Netherlands and Switzerland, we observe falling donations and donors.
- The findings appear to contradict an overall trend observed in the case of volunteerism in Germany.
- Donors donated well below their capacity and their blood type was in line with the wider German donor population.

What Problem Was This Research Addressing?

Despite the introduction of restrictive transfusion policies and patient blood management strategies, blood collection services still face multiple challenges in meeting supply. An ageing population and an increase in the number of medical innovations available have increased the demand for care and thus for blood and blood products. Furthermore, the short shelf life of blood (3-5 weeks) makes the stockpiling of reserves challenging and the unpredictable nature of events such as natural disasters (e.g. floods, storms, etc.) and viral epidemics such as influenza may increase the short-term demand for blood, making meeting supply challenging. We report changes in whole blood donations, donors and their behaviour over 9 years at a large German teaching hospital.

What This Research Adds

Very few studies have looked in detail at changes in the donor base and donations over longer periods. Our findings provide context to the changing pattern of prosocial activities in Germany and show that despite increased rates in prosocial behaviour in the case of volunteerism overall, blood donations have decreased in our setting as has been reported across other regions in Germany.
These findings are important in that they provide our centre with essential information for guiding future recruitment campaigns. We recommend that Highly Active and former Highly Active donors are more carefully considered when planning donor engagement strategies and effort made in (at the very least) maintaining their donation activity.

Methods

An analysis of over 34,000 donors and 265,000 donations from a large university hospital's blood centre was conducted using data from July 2008 to December 2017. The analysis focussed on (a) whole blood donations and (b) donor characteristics and how they changed over time. We categorised donors into four categories according to their donation activity (First-Time, Highly Active, Active and Reactivated) (Table 1). The classification system was adapted from existing definitions used for reporting to the Robert Koch Institute (RKI) and aligned with those used by DOMAINE, a European wide project (Donor management in Europe) [1].

Project Partner:

[1]Hamburg Center for Health Economics,[2] Institut für Transfusionsmedizin, University Medical Center Hamburg-Eppendorf (UKE)

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Table.1 Classification of donors by year

Donor category	Sub category	Definition
First-Time (FT)	-	First time donation within study year.
Repeat (RD)	Highly Active (RD<6)	Donor presents in study year within 6 months of last donation and is neit her First-Time nor Reactivated.
	Active (RD 6-24)	Donor presents in study year within 6-24 months of last donation and is neither First-Time, Reactivated nor Highly Active.
	Reactivated (RD>24)	Last time donor appeared to donate was over 24 months prior to donation in study year.

Research Findings

We observed falling donations over time and an increase in the average time between donations, suggesting that donors donated less frequently. The results show a peak in donations in 2011 with over 31,000 donations and a steady decline in donations over time falling to 24,520 donations in 2017 (Figure 1). Furthermore, we show a downward trend in the number of Highly Active donors and a more stable trend in First Time donors. Highly Active donors dropped to just over 5,500 donors in 2017 from 6,851 donors in 2009 (Figure 2). We also provide evidence that donors donated well below their donation capacity and that the blood type of donors appeared to be in line with the wider German donor population.

In line with other regions in Germany, the Netherlands and Switzerland, we observe falling donations and donors. The trends observed in the blood donation context appear to contradict a wider trend observed in prosocial activities across Germany reported in the case of volunteerism, where despite volunteers spending less time volunteering, participation rates have increased from 35.9% in 2009 to 43.6% in 2014 according to a large government survey [2]. The return rates following a first time donation in particular fell quite substantially over the time period, falling from 72% in 2008 to 57% in 2016.

This Policy Brief was adapted from a full article [3].

Policy Relevance of Research

- The findings are relevant to blood collection agencies in that they provide information for guiding future recruitment campaigns.
- Highly Active and former Highly Active donors should be carefully considered when planning donor engagement strategies and effort made in (at the very least) maintaining their donation activity.
- We show a large drop in return rates among first-time donors, we therefore recommend developing interventions that aim to improve donor retention for early career donors.
- Given that we observed a higher preference for donations at lunchtime, before and after work, we recommend centres consider extending opening hours to accommodate for these periods.

Figure 1. Total, first-time and repeat whole blood donations, 2008-2017

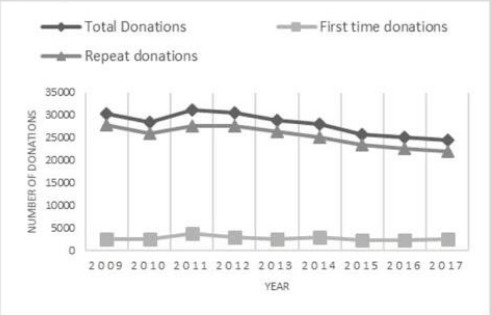
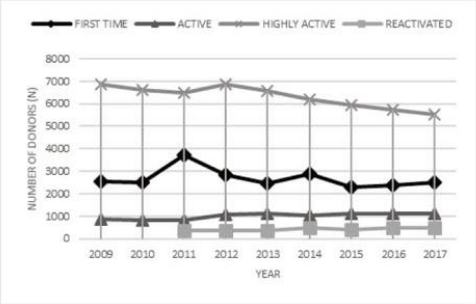


Figure 2. Whole blood donors by type, 2009-2017



References

1. De Kort W, Veldhuizen I: Donor management manual. Nijmegen, the Netherlands: DOMAINE project 2010
2. Federal Ministry for Family Affairs, Senior Citizens, Women and Youth: Volunteering in Germany: Key Findings of the Fourth German Survey on Volunteering. 2017
3. Chandler T, Hiller J, Peine S, et al.: Blood donation and donors: insights from a large German teaching hospital (2008–2017). Vox sanguinis

Acknowledgements

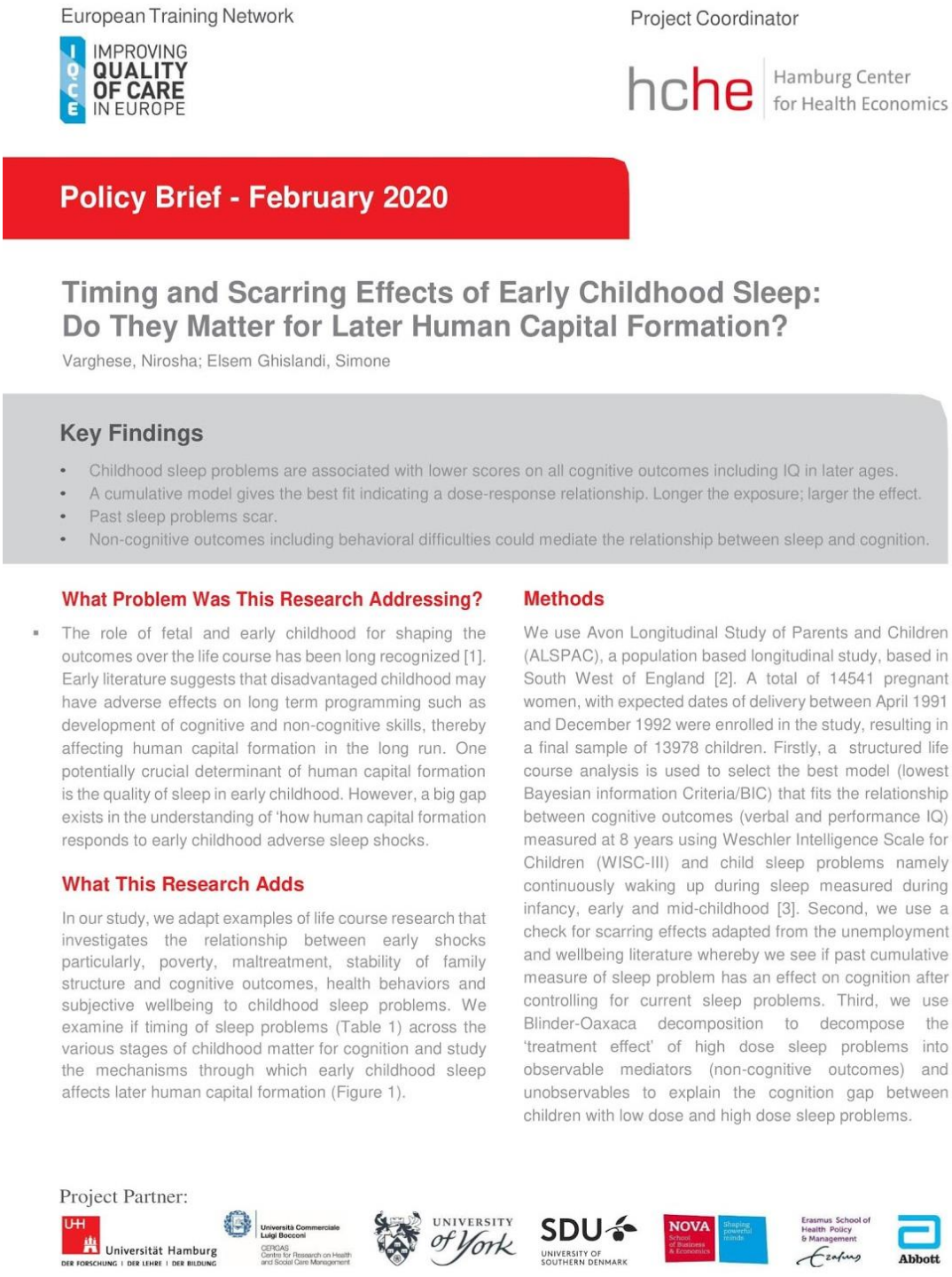
This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 4, February 2020: "Timing and scarring effects of early childhood sleep: do they matter for later human capital formation?" by Nirosha Varghese**



European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - February 2020

Timing and Scarring Effects of Early Childhood Sleep: Do They Matter for Later Human Capital Formation?

Varghese, Nirosha; Elsem Ghislandi, Simone

Key Findings

- Childhood sleep problems are associated with lower scores on all cognitive outcomes including IQ in later ages.
- A cumulative model gives the best fit indicating a dose-response relationship. Longer the exposure; larger the effect.
- Past sleep problems scar.
- Non-cognitive outcomes including behavioral difficulties could mediate the relationship between sleep and cognition.

What Problem Was This Research Addressing?

The role of fetal and early childhood for shaping the outcomes over the life course has been long recognized [1]. Early literature suggests that disadvantaged childhood may have adverse effects on long term programming such as development of cognitive and non-cognitive skills, thereby affecting human capital formation in the long run. One potentially crucial determinant of human capital formation is the quality of sleep in early childhood. However, a big gap exists in the understanding of 'how human capital formation responds to early childhood adverse sleep shocks.

What This Research Adds

In our study, we adapt examples of life course research that investigates the relationship between early shocks particularly, poverty, maltreatment, stability of family structure and cognitive outcomes, health behaviors and subjective wellbeing to childhood sleep problems. We examine if timing of sleep problems (Table 1) across the various stages of childhood matter for cognition and study the mechanisms through which early childhood sleep affects later human capital formation (Figure 1).

Methods

We use Avon Longitudinal Study of Parents and Children (ALSPAC), a population based longitudinal study, based in South West of England [2]. A total of 14541 pregnant women, with expected dates of delivery between April 1991 and December 1992 were enrolled in the study, resulting in a final sample of 13978 children. Firstly, a structured life course analysis is used to select the best model (lowest Bayesian information Criteria/BIC) that fits the relationship between cognitive outcomes (verbal and performance IQ) measured at 8 years using Weschler Intelligence Scale for Children (WISC-III) and child sleep problems namely continuously waking up during sleep measured during infancy, early and mid-childhood [3]. Second, we use a check for scarring effects adapted from the unemployment and wellbeing literature whereby we see if past cumulative measure of sleep problem has an effect on cognition after controlling for current sleep problems. Third, we use Blinder-Oaxaca decomposition to decompose the 'treatment effect' of high dose sleep problems into observable mediators (non-cognitive outcomes) and unobservables to explain the cognition gap between children with low dose and high dose sleep problems.

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Table 1. Sleep problem variable definition

Infancy sleep problem	1 = sleep problem at age 18 or 30 months 0 = no sleep problem at age 18 or 30 months
Early childhood sleep problem	1 = sleep problem at age 42 or 57 months 0 = no sleep problem at age 42 or 57 months
Mid-childhood sleep problem	1 = sleep problem at age 69 or 81 months 0 = no sleep problem at age 69 or 81 months
Cumulative sleep problem	Sum of infancy, early childhood and mid-childhood variables (range: 0-3)
Persistent sleep problem	1 = sleep problems in infancy, early childhood and mid-childhood 0 = all else
Any sleep problem	1 = sleep problems in infancy, early childhood or mid-childhood 0 = all else

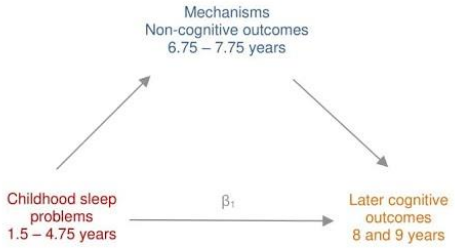
Research Findings

The prevalence of sleep problems varies over time, from infancy to mid-childhood. Almost 45% of the children has at least one sleep problem. Sleep problems are associated with lower scores on all cognitive outcomes including that of verbal and performance IQ. Most importantly, we find that an accumulation model of sleep fits the data best compared to alternative variables encoding other sleep exposure patterns. This implies that longer the exposure to childhood sleep problems, larger is the adverse effects on cognition. Results from analysis of scarring effects of sleep shows that past cumulative measures of sleep are associated with cognition outcomes even after controlling for the current sleep problem. Therefore, past sleep problem 'scars. The decomposition analysis shows that behavioral difficulties could potentially mediate the relationship between sleep problems and cognition. In particular, behavioral difficulties and number of social fears widens or increases the cognition cap between children with and without sleep problems (Table 2).

Policy Relevance of Research

- Findings show that timing of sleep problem does not matter. This is important for timing of policy intervention indicating interventions to improve sleep can be implemented at any point in time (given the results) during childhood.
- Nevertheless, past sleep problems in infancy or childhood has a scarring effect on cognition implying intervention at earlier ages is still better. Better returns for cost of investment at earlier ages.
- Mediating effects of behavioral problems in addition to malleability of behaviors indicates the possibility of interventions aimed at improving behavioral problems to reduce the negative effects of sleep problems on cognition.

Figure 1. Channels through which early sleep problems may affect later cognition outcomes



Variance decomposition method proposed in Heckman & Pinto (2015) and applied in Heckman et al. (2013)

Table 2: Summary of results

	IQ	Short-term memory	Mathematical Reasoning
BIC	32046.9	19445.4	9837.3
Coefficient	-0.96	-0.13	-0.20
95% CI	(-1.38,-0.54)	(-0.22,-0.04)	(-0.32,-0.89)
Scarring effects	Yes	Yes	Yes
Mediation effects	Yes	Yes	Yes

References

1. D.J.P. Barker, editor. Fetal and Infant Origins of Adult Disease. British Medical Journal, London, 1992
2. Boyd A, Golding J, Macleod J, et al. Cohort Profile: the 'children of the 90s'–the index offspring of the Avon Longitudinal Study of Parents and Children. Int J Epidemiol. 2013; 42(1): 111–127.
3. Ben-Shlomo, Y., Mishra, G., Kuh, D., 2014. Life course epidemiology. In: Ahrens, W., Pigeot, I. (Eds.), Handbook of Epidemiology. Springer, New York.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 5, April 2020: "The effect of the clinical environment on surgeons' treatment choices" by Luis Fernandes**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - April 2020

The Effect of the Clinical Environment on Surgeons' Treatment Choices

Luis Fernandes, Nils Gutacker, Martin Chalkley

Key Findings

- Orthopaedic surgeons vary substantially across (and within) NHS hospitals in their propensity to perform cemented hip replacements
- The clinical environment where surgeons work matters for the treatment decisions they make, and possibly more than their own beliefs and preferences
- We find no evidence that surgeons select their hospital of practice based on their own treatment style

What Problem Was This Research Addressing?

Recent studies show that provider supply-side factors are more important than patient demand-side characteristics in explaining the observed geographic variations in health care. A supply-side explanation for such variations can arise from two distinct sources. One possibility is that the clinical environment wherein physicians practice has causal effects on their treatment decisions, and therefore moving a physician across providers would change his or her practice style. The other possibility is that physicians with more aggressive treatment styles, as a result of alike beliefs or preferences, may flock in the same place, giving rise to hospitals with relatively more aggressive treatment patterns. In this study, we test the relative importance of these hypotheses and provide quasi-experimental evidence of the effect of the clinical environment on physicians' practice style. In particular, we study how quasi-random changes in the clinical environment experienced by NHS orthopaedic surgeons moving across hospitals in the UK affects their own treatment choices between two substitutable methods of fixation – cemented and cementless - in hip replacement surgery.

What This Research Adds

This study contributes to the recent debate on supply-side sources of geographic variation in health care. We build on the work of Molitor (2018) and extend this limited literature in two different ways. First, we investigate this question in a clinical setting that is distinct and has advantages relative to the heart attack context examined by Molitor (2018). Unlike the treatment options for heart attacks, cemented and cementless hip implants are perfect substitutes with similar therapeutic success, they are available in in every hospital across the country, and surgeons are trained in both techniques. This purges our analysis from the potential effect of local resource constraints or the clinical superiority of one method over the other. Second, we exploit this question in the English NHS, which is structurally different from the Medicare programme in the US. A distinctive feature is the fact that the NHS covers most of the UK population whereas the US Medicare is restricted to the over-65 population, and thus findings can hardly be generalised to the under-65 population across the country.

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Methods

To measure the extent to which the clinical environment drives the treatment style of surgeons, we make use of patient-level administrative data from all publicly funded care in England, which includes detailed information on patient characteristics, clinical data, and identifiers for the hospital and surgeon responsible for the care. We construct surgeons' employment histories to identify those who move their practice across hospitals. The exogenous shock in the clinical environment that is provided by this quasi-random re-allocation of surgeons to hospitals is then used to estimate the effect of the hospital environment on treatment choices. Since our interest lies in the treatment choice between cemented and cementless hip implants, we characterise the hospital environment by the risk-adjusted rate of cemented hip replacements for all surgeons in the hospital, omitting the moving doctor's own cases.

Research Findings

We first show that there is large variation in cemented rates between (and within) NHS hospitals in the English NHS (see Figure 1). We also find that the hospitals wherein surgeons practice matter for their treatment style: surgeons moving from low- to high-cemented environments proportionally increase the use of cemented implants. A 10 percentage points change in the hospital environment changes a surgeon's likelihood to perform cemented hip replacements by 6.4 percentage points. Symmetrically, moving to low-cemented environments reduces the propensity for cemented implants. In Figure 2, we show two other results. First, surgeons' practice style prior to the move does not vary systematically with the change in environment (premove coefficients are close to zero and insignificant), suggesting that the timing and choice of destination is very unlikely correlated with the practice style of surgeons before the move. Second, surgeons adapt fairly immediately following the move, without any further adjustments over time (postmove coefficients remain flat). Furthermore, we examine whether such quick change in the practice style across the move impacts patients' health outcomes after surgery. We find no effect of the move on 28-day emergency readmissions, one-year revision rates, or patient-reported outcome measures (PROMs).

*Notes: Hospitals (black and bold data points) are ranked in ascending order of hospitals' cemented rate. The light and grey data points are for individual surgeons practicing in that hospital.

Policy Relevance of Research

- There is substantial between and within hospital variation in the proportion of cemented cases across the English NHS
- We show that in trying to tackle such variation, policy makers must target both the institutions and the physicians working in them
- Moving surgeons adapt immediately rather than gradually to the new hospital, implying that changes in the clinical environment could have large effects in the short run
- Simultaneously, the lack of postmove convergence suggests that policies aimed at changing physician-specific factors such as beliefs and preferences may only have an effect in the long run

Figure 1. Distribution of Hospitals and Surgeons Cemented Rate*

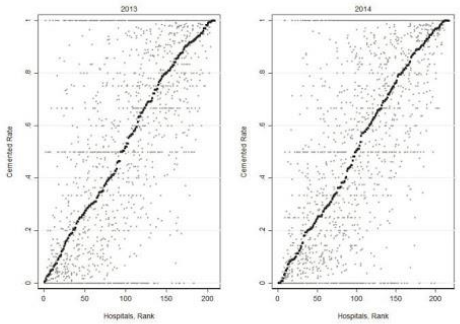
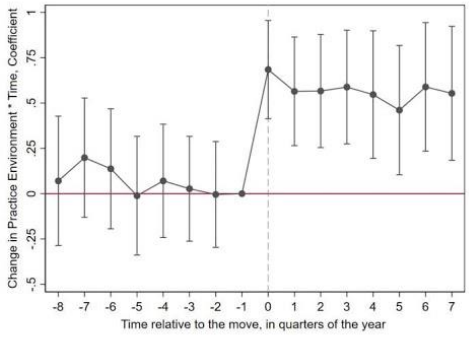


Figure 2. Surgeon's Response to Change in Environment



References

1. Molitor, D. (2018) 'The evolution of physician practice styles: Evidence from cardiologist migration', American Economic Journal: Economic Policy, 10(1), pp. 326–356. doi: 10.1257/pol.20160319.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 6, June 2020: "Impacts of an integrated electronic health record / disease management program for type 2 diabetes patients in Denmark" by Ryan Pulleyblank**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - June 2020

Impacts of an Integrated Electronic Health Record / Disease Management Program for Type 2 Diabetes Patients in Denmark

Ryan Pulleyblank

Key Findings

- Use of an electronic health record (EHR) system with a disease management program (DMP) for types 2 diabetes was associated with increased quality of healthcare delivery without increasing overall costs of healthcare treatments. Costs in general practice increased marginally while emergency hospital costs decreased.

What Problem Was This Research Addressing?

This research investigated a national effort to improve the quality of healthcare for patients with type 2 diabetes without using financial incentives. Cost-effective delivery of healthcare is critical in a world with increasing healthcare costs and budgetary pressures. Although the use of electronic health record systems and associated disease management programs being increasingly common, associated impacts on healthcare efficiency and costs are not well understood. If use of EHR/DMP can be demonstrated to increase the quality of care provided to patients without increasing healthcare costs, then their use would be considered cost-effective. Evidence of cost-effectiveness can strengthen the case for EHR/DMP, leading to improved population health.

What This Research Adds

This research provides the first estimates of financial impacts within a national healthcare system attributed to the use of an integrated EHR/DMP with a performance reporting system for type 2 diabetes patients. Our analysis is based on a Danish case study. Denmark is a country with a publicly financed healthcare system covering primary and secondary care sectors. Exploiting comprehensive administrative datasets, this study was able to identify which healthcare sectors experience increased, decreased, and no impacts on net healthcare expenditures attributable to the use of an EHR/DMP. This evidence demonstrates the value of integrated healthcare systems, where decision makers can realize tradeoffs between healthcare sectors.

Methods

Exploiting the panel structure of our dataset (2008-2014), we included GP fixed-effects in order to reduce bias caused by systemic GP-level variation between GPs who used the system at a high level, and GPs who never used the DMP. Models controlled for secular annual trends and included an indicator for exposed patients in the exposure period (2012/13/14), capturing the impact of the EHR/DMP. A range of health and socio-demographic characteristics believed to explain variation in healthcare demand,

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

access, and treatment costs were included. Costs outcomes were log-transformed, mitigating high-cost outliers and allowing impact interpretation as % difference.

Research Findings

Estimated mean annual healthcare cost impacts are presented in Table 1. Unadjusted average annual healthcare costs are presented in Figure 1. We found no evidence of a significant impact of EHR/DMP use on total healthcare costs. These results indicate that there was a small positive impact of EHR/DMP use on type 2 diabetes patients' annual treatment costs in general practice (3.2%, 95% CI: 0.9%, 5.6%), and a small negative impact on annual emergency hospital visit costs (-6.4%, 95% CI: -11.6%, -1.2%).

While a change in GP costs was observed, the small impact suggests that most type 2 diabetes patients at GPs using the EHR/DMP were not treated substantially differently than they would have been without the system. The evidence supports that the EHR/DMP achieved its intended impact: that patients who were undertreated received additional appropriate attention.

Reduced emergency hospital visit costs, but no significant impact on overall hospital costs, suggests that using the EHR/DMP resulted in GPs more effectively referring diabetes patients to hospital where appropriate, reducing the frequency/severity of acute health emergencies. This reflects an improvement in the average quality of care.

Use of an EHR/DMP was associated with an improvement of the procedural quality of care delivered amongst type 2 diabetes patients, at no overall increase in healthcare costs. This suggests an efficiency improvement to the Danish healthcare system associated with use of the EHR/DMP.

This Policy Brief is based on published findings (Pulleyblank. et al. 2020).

Policy Relevance of Research

Non-financial incentives including EHR/DMP systems with performance reporting can improve quality of care without increasing total costs. This research provides empirical evidence of healthcare system benefits resulting from data-driven disease management systems, specifically amongst type 2 diabetes patients.

Figure 1. Unadjusted Average Annual Healthcare Costs

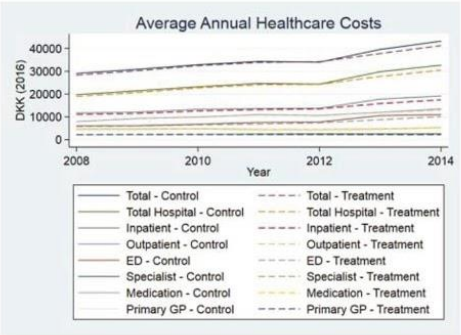


Table 1. Impact of EHR/DMP Use and Annual Healthcare Cost Differences (%/100)

Healthcare Cost Category	Estimate	(se)
Total Healthcare	-0.001	(0.010)
Primary Care - GP	0.032**	(0.012)
Medication	-0.006	(0.011)
Non-Hospital Specialists	0.031	(0.020)
Total Hospital	-0.008	(0.034)
Hospital Outpatient	0.005	(0.033)
Hospital Inpatient	-0.026	(0.030)
Hospital Emergency	-0.064*	(0.027)

* $p \leq 0.05$, ** $p \leq 0.01$.

References

1. Pulleyblank R, Mellace G, Olsen KR. (2020). Evaluation of an electronic health record system with a disease management program and health care treatment costs for Danish patients with type 2 diabetes. JAMA Network Open. 3(5):e206603. doi:10.1001/jamanetworkopen.2020.6603

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 7, July 2020: "The effect of hospital cost/price on quality of care" by Sara Jamalabadi**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - 10th July 2020

The effect of hospital cost/price on quality of care

Sara Jamalabadi, Vera Winter, Jonas Schreyögg

Key Findings

- There is no general relationship between cost/price and the quality of care.
- The relationship between cost/price and the quality of care seems to depend on the condition and specific resource utilization.
- Different countries/regions have different regulations for quality assurance (e.g., staffing regulation, mortality and morbidity-conferences, technology use, and minimum volumes), which clearly has an effect on cost and quality.

What Problem Was This Research Addressing?

Limited empirical evidence exists regarding the effect of price/price changes on hospital quality of care. Drawing upon evidence suggesting that a link exists between cost and quality appears to be fruitful because DRG prices in most countries are based on hospital cost information such that costs and prices are closely related.

This study aims to provide an overview of the existing evidence regarding how price affects the quality of care in the hospital setting. Therefore, we conduct a literature review of studies analyzing the association between price and the quality of care in hospitals. However, because few studies investigating this relationship exist and prices often rely on the costs of hospital care, we additionally provide a literature review of studies investigating the relationship between hospital cost and the quality of care.

In addition, several critical design characteristics may alter the association between cost/price and the quality of care. Therefore, it is essential to separate the results based on defined key characteristics. In this study, we assess whether the results systematically vary depending on (i) the cost/price measures used; (ii) the quality measures used; (iii) the country in which the study was conducted; (iv) the clinical condition(s) investigated; and (v) the methodological approach used, particularly the degree to which studies approximate the causal effect based on the method used to address confounding

What This Research Adds

To date, only one systematic review performed by Hussey et al. (2013) has analyzed the association between cost and the quality of care; however, some questions remain unanswered. First, their review only focuses on the association between cost measures and the quality of care; these authors do not consider price/reimbursement. Therefore, an overview of the price-quality relationship is lacking. Second, these authors exclude studies involving non-US data sources. Therefore, an overview of cross-country comparisons is lacking. Finally, an overview of whether the results differ depending on the clinical condition is lacking. This study addresses these gaps in the literature and considers studies published since 2012, substantially increasing the quantity of evidence.

Methods

Searches for literature related to the effect of hospital cost and price on the quality of care, including studies published between 1990 and March 2019, were carried out using four electronic databases, namely, PubMed, Scopus, EconLit, and ScienceDirect. On the basis of the inclusion and exclusion criteria, 22 articles were included through the systematic search (see Figure 1). In addition, 21 studies included by Hussey et al. and four initial studies investigating the 'price-quality' relationship were added to our final review (i.e., a total of 47 studies).

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

The extracted data included the articles' title, author, year of the study, the country in which the study was conducted, samples and years of data collection, study design, clinical condition(s) investigated, types of quality measures, types of cost/price measures, methodological approach, and the direction of the association/causality between hospital cost/price and the quality of care.

The quality of care was assessed using different outcome and process indicators. The outcome indicators comprised the following five main categories: mortality, readmission, complication, composite measures, and quality of life indexes.

The primary study outcome of interest was the direction and statistical significance of the reported association between the hospital cost/price and the quality of care. We evaluated the direction of the association by indicating whether the association was (significantly linear/nonlinear)positive,(significantly linear) negative, (significantly) U-shaped/inverted U-shaped, or not significant.

Policy Relevance of Research

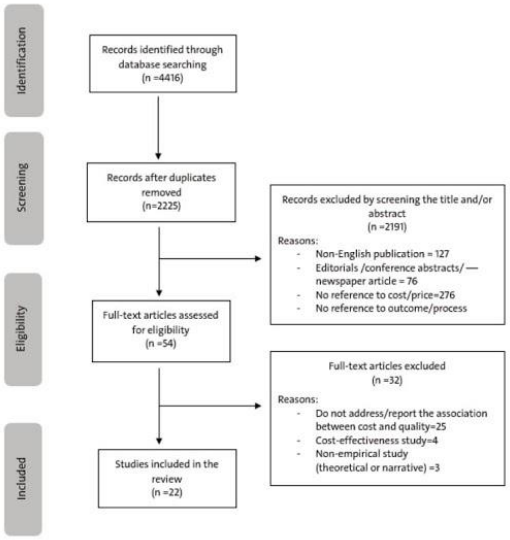
- Policymakers should be prudent with the measures used to reduce hospital costs to avoid endangering the quality of care, especially in resource-sensitive set tings.
- Estimates of the cost-quality relationship and map ping that relationship to area / hospital/ health care system characteristics could aid the identification of cost-effective strategies for quality improvement.
- Given that we observed the cost-quality relationship could be non-linear (i.e., U-shaped), we therefore recommend considering the position hospitals on the curve. The position could influence the findings and af fects further decisions on a specific quality improve ment strategy.

Research Findings

We find highly mixed evidence of the association. Overall, 74 (33%) associations between the unit cost/price and the unit quality were significantly positive, 33 (15%) associations were significantly negative, 11 (5%) associations were significantly U-shaped/inverted-U-shaped, and 105 (47%) associations were not significant.

One potential explanation is the multiple ways that price and cost can relate to the quality of care. Another explanation might be the high heterogeneity across the included studies. Most notably, the overall pattern of the relationships between hospitals' price-quality and cost-quality were quite similar. Indeed, some variations can be explained by the studies' characteristics. In particular, we find that the proportion of studies that detected a significantly positive association is higher when a) price/reimbursement is used (instead of cost); b) process measures are used (instead of outcome measures); c) the focus is on AMI, CHF, and stroke patients (instead of patients with other clinical conditions or all patients); and d) the methodological approach used to address confounding is more sophisticated.

Figure 1. Flow diagram of the literature search



References

Jamalabadi S, Winter V & Schreyögg J (2020) A Systematic Review of the Association Between Hospital Cost/price and the Quality of Care. Applied Health Economics and Health Policy, https://link.springer.com/article/10.1007/s40258-020-00577-6

Hussey, P. S., Wertheimer, S., & Mehrotra, A. (2013) The association between health care quality and cost: a systematic review. Annals of Internal Medicine, 158(1), 27-34.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 8, August 2020: "A methodological approach to aggregate multiple measures of hospital quality using variance-based weights" by Angela Meggiolaro**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - August 2020

A methodological approach to aggregate multiple measures of hospital quality using variance-based weights

Angela Meggiolaro, Carl Rudolf Blankart, Tom Stargardt, Jonas Schreyögg

Key Findings

- The composite index specifies an indirect measure of hospitals' performance.
- The Accelerated Failure Time system of regressions is more efficient compared with the widely used generalized linear models (GLM) that rely on dichotomized data.
- Variance weights elicitation is data driven and less exposed to bias of normative approaches.
- Risk adjustment and acute cardio vascular events (CVE) prevent selection bias and "cherry picking".

What Problem Was This Research Addressing?

Quality of care can be defined as "health improvement in relation to the best possible outcome that could have been achieved with the application of the current medical knowledge". Essentially, the health benefits on health outcomes stem roughly from three levels: the individual level; the health care provider level that includes hospitals; and the socio-cultural context. The main objective of this study was to develop and validate a composite index to assess quality of hospital care and to observe how the variability in performance is distributed across German providers. Moreover, we attempt to rank the hospitals into league tables. In particular, we observed how the hospital ownership affects the outcomes. In order to assess the quantity of stochastic variation attributable to hospitals, the index requires: (a) different quality dimensions measurable by using distinct indicators, (b) indication-specific risk adjustment and (c) aggregation of different quality dimensions.

What This Research Adds

The methodology applies a likelihood-based Accelerated Failure Time (AFT) model and controls for correlation across different outcome indicators by a simultaneous equations estimation. The variance-based weights aggregate different quality indicators into a single composite index. The advantage of the aggregation based on statistical weights is twofold. First, the variance weights rely on the precision of the estimation. In fact, each indicator contributes more to the aggregated quality index when it has less variance. Second, the weights reduce the effects of heteroscedasticity. More important, data driven weights are robust to normative weights approaches. A viable two-stage procedure to derive hospitals' quality indicator was already suggested by Chua et al. in 2010. Unlike the linear regression based on dichotomized data adopted by Chua, the AFT model included two outcomes, mortality and readmissions, and accommodates time as 'endogenous'. Yet, two quality outcomes were aggregated across four cardiovascular events (CVE) by distinctively controlling for intervention-specific risks.

Methods

For the analysis, we obtained access to the administrative databases of a large German sickness fund. We exploited patient level data from 2005 to 2017. In the first stage of the AFT model, we simultaneously estimated eight equations (i.e., one equation for outcome and intervention). We controlled for patient characteristics, outcome- and intervention-specific

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG · Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management · University of York · SDU University of Southern Denmark · NOVA School of Business & Economics · Erasmus School of Health Policy & Management · Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

hospital covariates, hospitals' geographical location and GDP per capita at regional level.

The variance-covariance matrix from the first step regression is not an identity matrix, since we allowed for correlation across outcomes and interventions. The weights were manually computed as the inverse of the first step variance. Hence, holding the heteroscedasticity assumption, we estimated the second step AFT by using a weighted regression. Moreover, we replaced the matrix consisting of outcome- and intervention-specific hospital 'fixed' effects in the first AFT, with the hospitals' ID dummies. Thus, we interpreted the hospitals' estimates and the confidence intervals (CI) in the second step AFT, as the adjusted measure of hospitals' performance, expunged of the effect of case-mix and providers' characteristics. For readability, we standardized the aggregated hospital quality parameters and the corresponding confidence intervals into a scale between 0 and 10. In order to test for internal validity, we run a sensitivity analysis.

Research Findings

The AFT results presented a significant negative association between teaching hospitals' bed capacity and time to event. In particular, each extra bed was associated with a 1% decrease in expected time to death or readmission. Regarding the hospitals ownership, for private hospitals the time to readmission or death resulted shorter than non-private hospitals (-16%). The West Germany providers exhibited an expected time to event 57% faster than hospitals located in East Germany. The yearly GDP per capita was significant; however, the magnitude of the negative coefficient was close to zero. As expected, the precision-based weights were higher for mortality than readmission in all CVE. The results appeared consistent with the clinical literature. Based on the AFT hospitals' parameter estimates and CI, we built the hospitals' rank. (Figures 1 and 2). All the values less or equal to the mean performance estimate (4.35) denote a poor performance and are labelled as top1, conversely, the hospitals scoring greater or equal to 4.35 are grouped into the higher performance cohort, labelled as top3 (Figure 1). As expected, teaching hospitals performed better than non-teaching, with an average rank of 4.55. In terms of hospital ownership, private non-profit hospitals revealed the highest mean estimate (4.53), as compared to private and public hospitals (Figure 2).

Policy Relevance of Research

- The variance based AFT method can aggregate several dimensions of health care outcomes.
- The quality index can foster quality-based competition in a competitive hospitals' market.
- The standardized method may support monitoring purposes in imperfect healthcare markets.
- A statistical tool based on precision of estimates may address patient's hospital choice.

Figure 1. Aggregated hospital quality with hospitals' ranking. top1= red top2=grey top3= green.

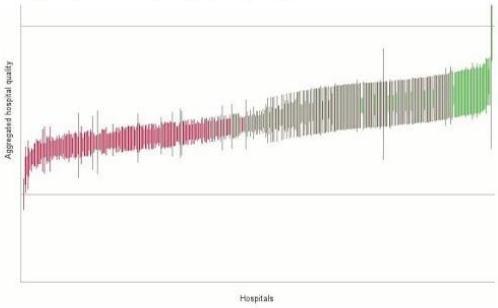
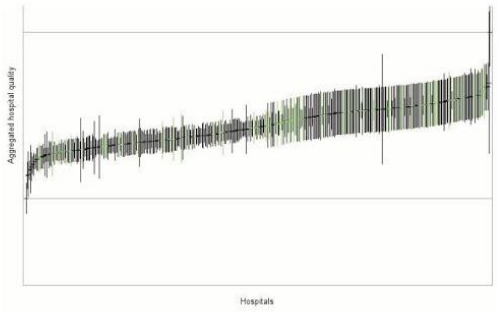


Figure 2. Aggregated hospital quality. Index range from zero to 10.



References

1. Chua, C. L., Palangkaraya, A., & Yong, J. (2010). A two-stage estimation of hospital quality using mortality outcome measures: an application using hospital administrative data. Health Economics, 19(12), 1404-1424.
2. Schreyögg, J., Stargardt, T., & Tiemann, O. (2011). Costs and quality of hospitals in different health care systems: a multi-level approach with propensity score matching. Health Economics, 20(1), 85-100.
3. McClellan, M. B., & Staiger, D. O. (2000). Comparing hospital quality at for-profit and not-for-profit hospitals. In The changing hospital industry: Comparing not-for-profit and for-profit institutions (pp. 93-112). University of Chicago Press.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 9, September 2020: "Policy responses and people's perceptions during the COVID-19 pandemic" by Iryna Sabat**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - September 2020

Policy Responses and People's Perceptions During the COVID-19 Pandemic

Iryna Sabat

Key Findings

- Citizens were overall satisfied with their vernment's response to the COVID-19 outbreak
- A north-south pattern across the EU states was observed in public opinion, worries and trust
- COVID-19 pandemic acted as a stressor, causing health and economic anxieties
- Containment policies offered lessons for the design of lockdown exit strategies

What Problem Was This Research Addressing?

At the onset of the pandemic, European countries undertook a range of countermeasures to contain and mitigate the impact of the COVID-19 outbreak, including international and domestic mobility restrictions, school closures, bans of public gatherings, and lockdowns. Some countries considered an implementation of more controversial interventions, such as banning medical exports or usage of mobile phone data for tracking purposes. All of this raised a lot of debate in every society about the appropriateness of the government response to the pandemic.
Hence, this study aimed at investigating the public sentiment towards the containment measures undertaken in Europe at the onset of the COVID-19 outbreak to learn about people's support for containment policies, their worries in relation to the unfolding epidemic, and their trust in different sources of information.

What This Research Adds

The data collection for this study was performed at the peak of the COVID-19 pandemic in Europe. Thus, this research constituted a fast reporting of a comparative policy perspective based on representative samples in a multi-country survey. It contributed to the state of knowledge about differences in people's beliefs and attitudes across and within European states. The key contribution of the study was drawing lessons from the containment stage to facilitate the development of the lockdown exit strategies and design of possible future policy interventions.

Methods

We surveyed over 7000 people representative of the population in seven European countries: Denmark, France, Germany, Italy, Portugal, the Netherlands, and the UK. The fieldwork was conducted at the height of the pandemic during April 2-15, 2020, using multi-sourced online panels provided by the market research company Dynata. The questionnaire was designed by the authors of the study except for the worry items that were adopted from the WHO COSMO project.
In each country, we collected data from a sample of 1000 respondents representative of the national population in terms of region, age, gender, and education. Given that the Italian region Lombardy was the most severely hit by the COVID-19 outbreak, we collected 500 additional responses in this region representative in terms of age and gender.

Research Findings

Policy support. On the European scale, citizens in all countries highly approved of measures taken by their government. Nevertheless, the extent of approval differed across individual countries and specific measures (Fig.1).

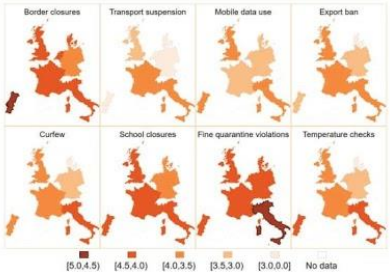
Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Figure 1. Mean support of government policies



We often noticed a north-south gradient in the EU: people living in the southern states (Portugal, Italy, and France) tended to support the containment policies more than residents in the northern countries (Denmark, Germany and the Netherlands). We observed also differences within separate countries: across regions and age categories. For example, older individuals tended to be more supportive of containment measures than younger people.

This may have been partly driven by the differences in risk perceptions regarding the health consequences of COVID-19 across age groups and by the degree of involvement in economic activity.

Worry. The results showed that people worried most of all about the health system getting overloaded so that the capacities could become insufficient to cope with the surge in COVID-19 cases. We observed that even in case of households that had not been directly hit by the novel coronavirus, the pandemic might have acted as a stressor causing health and economic anxieties. Interestingly, people in southern states were concerned with the economic consequences of the pandemic significantly more than people in other European countries (Fig.2).

Policy Relevance of Research

- Further containment measures and lockdown exit strategies need to be balanced against the factors that worry people in each specific country.
- The determinants of within-country differences in public opinion must be identified and addressed to secure public support of future policies and ensure high compliance with government measures.
- Policymakers may consider an asymmetric approach to the design of exit strategies or future containment measures taking region-specific levels of support and worry into account. This includes the identification of vulnerable categories of the population not only in terms of health risks but also with respect to social and economic activities, and addressing their concerns.
- Policymakers need to adopt effective strategies and means of communication whereby securing a sufficient level of trust and confidence from the society.

Trust in sources of information. Overall, people expressed the highest levels of trust in information from hospitals, family doctors, and the WHO, followed by information from the national government and main national news channels. This ranking of sources was similar in all countries covered by the survey, except for France, where citizens had a high level of confidence only in healthcare providers and placed relatively little trust in all other sources (Fig.3).

Figure 2. The proportion of respondents who worry „quite a bit" or „a lot"

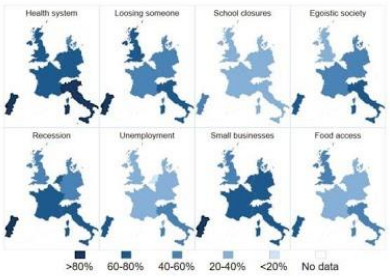
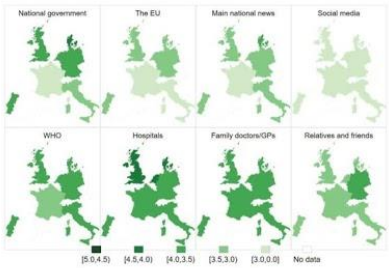


Figure 3. Mean trust in information sources in the context of COVID-19 situation



References

1. Sabat, I., Neuman-Böhme, S., Varghese, N. E., Barros, P. P., Brouwer, W., van Exel, J., ... & Stargardt, T. (2020). United but divided: Policy responses and people's perceptions in the EU during the COVID-19 outbreak. Health Policy.
2. C., Wieler L., Bosnjak M., et al. COVID-19 Snapshot MOnitoring (COSMO): monitoring knowledge, risk perceptions, preventive behaviours, and public trust in the current coronavirus outbreak. Psych Archives. 2020; (published online March 3.) DOI:10.23668/PSYCHARCHIVES.2776
3. OECD (2013), „Trust in government, policy effectiveness and the governance agenda", in Government at a Glance 2013, OECD Publishing, Paris. DOI: https://doi.org/10.1787/gov_glance-2013-6-en

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 10, October 2020: "Investigating the geographic disparity in quality of care: the case of hospital readmission after acute myocardial infarction" by Yuxi Wang**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - October 2020

Investigating the Geographic Disparity in Quality of Care: The Case of Hospital Readmission after Acute Myocardial Infarction

Yuxi Wang, Simone Ghislandi, Aleksandra Torbica

Key Findings

- The risk of readmission increases with age and being male, while hospitals with higher patient volume and capacity tend to have lower unplanned readmission.
- After risk-adjustments, there are differential effects of hospitalisation length-of-stay on the probability readmission across hospitals that are governed by different payment systems.
- There are substantial geographic variations in readmission rate across Local Health Authority and region, and the variations are explained by differences in length-of-stay and surgical procedures used.

What Problem Was This Research Addressing?

We investigate the geographic disparity in health care quality by focusing on one interesting measurement - unplanned hospital readmission, and for the elderly population. Unplanned readmissions are considered an intricate quality indicator and can be alarming for cost-conscious health care systems (Thomas & Holloway, 1991). The issue is related to equality in health care delivery that is discussed in the earlier section. Equal care for equal need implies that, if we are looking at one vulnerable segment of the population, and we tease out the factors that are beyond one's control, the provision of care should ensure equal opportunity of being well-treated. In this paper, we focus on the potential disparity in quality of care through differing provider behaviour in Italy.

What This Research Adds

There are two unique and important contributions to the literature from our findings. First, the differential effects of LOS on readmission across hospital types reflect the role of hospital discharge incentives, which, to our knowledge, was never explored in previous research. In particular, since public Hospital Units in Italy are financed by global budgets that are reimbursed ex-post, we expect that they have less pressure to discharge patients early for cost-saving purposes. Second, the geographic variation of unplanned readmission is primarily explained by the average hospital LOS an the differential procedures.

This result points to the potential geographic clustering of hospital discharge behaviour and adoptions of surgical procedures that can be important for policy-makers to improve equity of care. Third, the hierarchical geographic levels adopted in this paper are important units to consider given the highly decentralised healthcare system in Italy.

Methods

Geographic disparities in unplanned readmission are linked to factors from various levels. First, differences in the local profile of the patients (case-mix) can be relevant if there is geographic sorting of, for instance, demographic characteristics. Second, at the hospital level, we consider organisational factors such as the type of ownership and capacity. Third, the influence of Local Health Authority (LHAs) - specific random effects can contribute to the homogeneity within each of the healthcare market structures and the potential inter-LHA disparity in readmission rate. Finally, regional governments have considerable autonomy over their healthcare provision and fiscal policies, so the random effects at the regional level should also give rise to geographic variations. We thus need to account for the hierarchical geographic structure. Given the multiple sources of variability, we identified two most relevant models in the literature: hierarchical generalised linear model (HGLM) and Cox proportional model with mixed effects (Austin, 2017).

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi, CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

Marie Skłodowska-Curie Actions

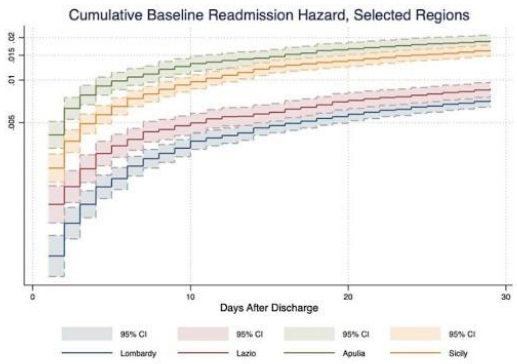
Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

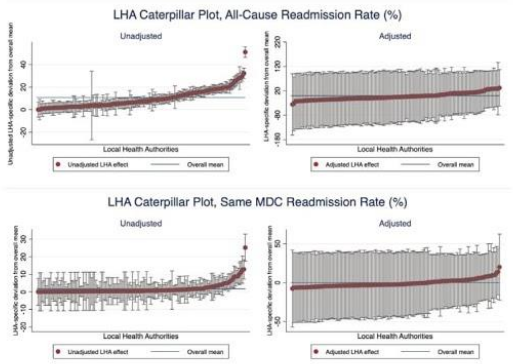
Research Findings

We have shown how differences in patient and hospital characteristics can contribute to the probability of readmission with hierarchical models. After accounting for sociodemographic and comorbidity variables, we found that the probability to be readmitted for all causes decreases with longer LOS for patients admitted to all types of hospitals. The magnitude of this negative effect is lower for independent public hospitals such as Hospital Trusts and Teaching Hospitals than for Hospital Units or Private Clinics. The use of PTCA and stent, CABG and catheter all decrease the probability of all-cause readmission, while the hospital AMI patient volume and capacity are both associated with lower all-cause readmission. Moreover, the effects of LOS, the different medical procedures and hospital types are relatively robust to aggregation to the hospital level. The results for readmission with the same MDC are comparable, while some coefficients lost significance. Our variance analysis further shows that there are strong contextual effects at the LHA and regional levels, while the variation in LOS and the use of different surgical procedures can explain a considerable proportion of the overall readmission variance. Our empirical results broadly reveal the potential pathway through which readmission rates vary across geographic areas – differential provider behaviours.

Policy Relevance of Research

- What we explored in this paper ultimately touches upon the trade-off between quality and efficiency and the potentially divergent trajectories of healthcare quality across regions.
- These findings indicate that the differences in readmission risks across hospital types are not solely driven by payment incentives. For instance, even though we are analysing emergency admissions, patient selection may still be present in certain regions. The existence of private insurance and payments may also facilitate more extended hospital stay.
- In general, the geographic variations in unplanned readmission that are driven by differential discharge behaviour, surgical procedures or other unobserved factors had profound implications on the equity dimension of the healthcare system.





References

Austin, P. C. (2017). A Tutorial on Multilevel Survival Analysis: Methods, Models and Applications. International Statistical Review, 85(2), 185–203. https://doi.org/10.1111/insr.12214

Thomas, J. W., & Holloway, J. J. (1991). Investigating Early Readmission as an Indicator for Quality of Care Studies. Medical Care, 29(4), 377–394. JSTOR

Wang, Y., Ghislandi, S. & Torbica, A. Investigating the geographic disparity in quality of care: the case of hospital readmission after acute myocardial infarction in Italy. Eur J Health Econ (2020). https://doi.org/10.1007/s10198-020-01221-9

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 11, November 2020: "Upcoding behaviour of GPs and response to changes in value of upcoding" by Jamie O'Halloran**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - November 2020

Upcoding behaviour of GPs and response to changes in value of upcoding

Jamie O'Halloran

Key Findings

- Up to 11% of all travel fees are upcoded whereas only 3% are downcoded
- After the fee rise, we observe a small reduction in upcoding of 0.5%
- This is driven by a reduction in the least valuable home visits of 1-2%
- However, we see an increase in upcoding one of the most valuable home visits of 6-7%

What Problem Was This Research Addressing?

This research seeks to determine if there is evidence of upcoding within primary care. We use Danish general practitioners (GPs) as a case study and investigate upcoding of home visits. Upcoding occurs when physicians use more expensive billing codes that the service actually provided. In this instance we investigate home visits and specifically travel distances.

Home visits are billed in a way such that the initial home visit on a journey is dependent upon the distance from the GP practice to the patient. Therefore, we are interested in GPs I f bill for the correct distance from their practice and the patient they visited. The codes for home visits are based upon distance bands; ≤4km , 5-8km 9-12km,13-16km 16-20km and ≥21km.

The second research question relates to whether the prevalence of upcoding changes when the value of upcoding increases. We exploit a fee increase of home visits of 150% in 2018 that changed the value of upcoding from €3-5 to €10-47. We hypothesise that the increase in the value of upcoding will lead to an increase in its prevalence as the gain is larger.

What This Research Adds

It is often difficult for policymakers and researchers to find strong evidence of physicians' gaming behaviour. The uniqueness of this study is that we can directly observe discrepancies in the service provided and the service billed. We were also able to investigate whether the size of the financial gains affects the likelihood of gaming.

Methods

We use of a balanced panel of all GP practices in Denmark from 2015 to 2018. The fee increases affect home visits provided in 2018.

We combine geographic and administrative data that allowed us to measure the travel distance from each address in Denmark to each GP practice. Therefore, we have the travel distance for every home visit conducted. We define upcoding to have occurred when the travel distance between the GP and their patient is less than the travel distance billed. To investigate whether there is evidence of upcoding, we test whether upcoding is more prevalent that downcoding.

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG · Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management · University of York · SDU University of Southern Denmark · NOVA School of Business & Economics · Erasmus School of Health Policy & Management · Abbott

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Downcoding occurs when the billed distance is greater than the distance billed. There is no incentive to do this thus it is thought of as being a measurement error We next investigate the effect of fee increases on the prevalence of upcoding. To achieve this, we use linear probability models with GP fixed effects to estimate the correlation between the fee increase and the prevalence of upcoding.

To achieve this, we interact a fee change dummy, which indicates if the home visit took place in 2018, after the fee increase, with a vector of dummies for each of the travel bands. As <4km home visits cannot be upcoded we exclude these home visits.

Table 1: Likelihood of upcoding by travel band

	Likelihood of upcoding	
	1km	2km
Bands – Ref 9-12km		
$band\ (5-8km)$	-0.081***	-0.183***
	(0.012)	(0.012)
$band(13-16km)$	0.012	0.033*
	(0.016)	(0.017)
$band(17-20km)$	0.181***	0.200***
	(0.027)	(0.026)
$band(+21km)$	0.184***	0.189***
	(0.032)	(0.033)
Fee*Bands		
$fee * band(5-8km)$	-0.012*	-0.012**
	(0.006)	(0.005)
$fee * band(9-12km)$	-0.024***	-0.031***
	(0.009)	(0.009)
$fee * band(13-16km)$	-0.008	-0.015
	(0.013)	(0.013)
$fee * band(17-20km)$	-0.024	-0.022
	(0.029)	(0.028)
$fee * band(\geq 21km)$	0.057*	0.069**
	(0.030)	(0.029)
N visits	210393	210393
N practices	1515	1515

Policy Relevance of Research

- There is evidence of upcoding behaviour within a primary care setting.
- Increasing the value of upcoding has mixed effects however, the change in behaviour is small.
- Though it led to an increase in the cost of upcoding, it is reassuring that it is not so widespread.

To account for measurement errors, we use two definitions of upcoding, one if the home visits is 1km or more way from the correct billing code and one if the home visit is 2km or more way from the correct billing code.

Research Findings

Firstly, we find that the prevalence of upcoding is greater than that of downcoding, with 10% of all home visits upcoding and 3% of home visits downcoded. Therefore, even in absence of the fee increase this is evidence that there does exist upcoding of home visits that cannot just be measurement error.

Table 1 shows the results for the second research question. We find that there is a reduction in upcoding after the fee increase of 1%-3% in the shortest distance bands (5-8km and 9-12km). However, we observe an increase in upcoding after the fee increase in the furthest distance band (≥21km). The smallest distance bands happen to be the least valuable to upcode whereas, the furthest ¬distance band is one of the more valuable home visits to upcode. Prior to the fee increase the cost of upcoding to the health payer was €80,000, equating to 1% of the cost of all home visits. However, after the fee increase it increased to €300,000, which is 3% of the total cost of home visits. Thus, the reduction in upcoding observed did not in fact reduce to cost of upcoding but increased it.

References

1. Brunt, C.S., CPT fee differentials and visit upcoding under Medicare Part B. Health Economics, 2011. 20(7): p. 831-841.
2. Angrist, J.D. and J.-S. Pischke, Mostly harmless econometrics: An empiricist's companion. 2008: Princeton university press.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

- **IQCE Policy Brief No. 12, December 2020: " Real-World Evidence of User Engagement With Mobile Health for Diabetes Management" by Anna-Katharina Böhm**

European Training Network

IMPROVING QUALITY OF CARE IN EUROPE

Project Coordinator

hche Hamburg Center for Health Economics

Policy Brief - 10th December 2020

Real-World Evidence of User Engagement With Mobile Health for Diabetes Management

Anna-Katharina Böhm

Key Findings

- Engagement with mHealth was higher for app modules with automated data collection, but initial uptake remained lower and occurred later compared to modules requiring manual data entry.
- Male users, older users and users who were recently diagnosed for the first time tended to use the app more actively.
- Although the app targets various aspects of diabetes management, most users took advantage of one specific app module.

What Problem Was This Research Addressing?

Mobile health (mHealth) apps provide novel possibilities for the management of diabetes [1]. They offer patients to play an active role in monitoring their condition, increase their treatment responsibility and often allow sharing the data with the health care practitioner (HCP). Hence, mHealth may be a way to increase quality of care while at the same time offering the potential to reduce healthcare costs. However, low digital competence or limited availability of technology could reduce the use. In addition, data privacy can be a concern and may lead users to omit use or enter incorrect information [2]. Lastly, it is difficult for the patient and the HCP to select the most appropriate app among those available on the market. Although mHealth requires active user engagement to be effective, there is little evidence exploring engagement with mHealth for diabetes.

What This Research Adds

The aim of this research was to study the use of mHealth among diabetes patients, here represented by the users of the Cornerstones4Care Powered by Glooko (C4C) app. In particular, the study aims to analyze how actively users engage with the app and to identify patient characteristics that are associated with user engagement. Addressing these issues will help to understand how mHealth apps can be used effectively and what areas could be optimized. Given the lack of consensus on how to assess user engagement, it was a subgoal of this paper to propose a set of theoretically founded user engagement metrics that were used to investigate user engagement in this study.

Methods

The C4C data set includes all records (manual and automated) collected during the period from app launch (June 28, 2017) to October 21, 2019. The data set is structured corresponding to the five main modules of the app: food intake, exercise, intake of medication, blood glucose (BG) values obtained by BG meters, and continuous glucose monitoring (CGM) device data. In addition, it contains basic user information. For each module, user engagement was estimated as the number of active days and using measures expressing the persistence (time until discontinuation of use), longevity (time from the first to the last entry), and regularity of interaction (average time between active days) within the first 180 days of use. Beta regressions were estimated to assess the associations between user characteristics and engagement outcomes for each module of the app.

Project Partner:

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG; Università Commerciale Luigi Bocconi CERGAS Centre for Research on Health and Social Care Management; University of York; SDU University of Southern Denmark; NOVA School of Business & Economics; Erasmus School of Health Policy & Management; Abbott

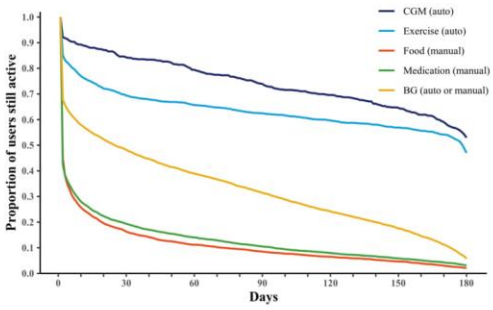
Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402

Research Findings

After giving consent, 43% of the users initiated use. Most users took advantage of only one of five modules of the app, indicating that the needs of patients with diabetes are heterogeneous. User engagement and the amount of collected data were higher for the (partly) automated modules (exercise, CGM) although initial uptake remained lower for these modules and first activity started later. One explanation for this may be the burden to connect the app to external devices or other apps and data protection or privacy concerns of the users.

Figure 1: Survival curves visualizing the relative dropout of users per module.



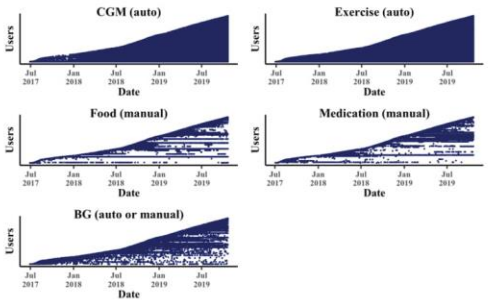
Users' engagement was determined by various patient characteristics: Although most users reported to be female, male users engaged significantly more with the app, except from the exercise module. Older patients tended to use the app more actively. One explanation for this novel finding could be that if older users overcome the burden to use the app, they may be motivated to apply their newly obtained skills. Recently diagnosed patients tended to use the app more intensively, too.

Policy Relevance of Research

- Only a subgroup of individuals who gave consent after download, initiated use (43%).
- To increase the sustainable use of mHealth, providers should consider the mode of data gathering and content design, but take into account privacy concerns of the users at the same time.
- Particular patient groups should be specifically targeted when integrating mHealth into the self-management of their disease. E.g., if older patients overcome potential barriers to initiate use, their engagement was higher compared to younger users.

They may have considered their mobile phone as a helpful tool when establishing their initial individual self-management strategy.
This policy brief was adapted form a full article [3].

Figure 2: Event diagrams expressing the user activity patterns per module over time. A dotted horizontal line represents a user's interaction with the app, and each dot represents an active day. The density of points shows a pattern of intensity of use.



References

[1] B Bellei, Ericles Andrei, et al. „Diabetes mellitus m-Health applications: a systematic review of features and fundamentals." Telemedicine and e-Health 24.11 (2018): 839-852.
[2] Fleming, G. Alexander, et al. „Diabetes digital app technology: benefits, challenges, and recommendations. A consensus report by the European Association for the Study of Diabetes (EASD) and the American Diabetes Association (ADA) Diabetes Technology Working Group." Diabetes care 43.1 (2020): 250-260.
[3] Böhm, Anna-Katharina, et al. „Real-World Evidence of User Engagement With Mobile Health for Diabetes Management: Longitudinal Observational Study." JMIR mHealth and uHealth 8.11 (2020): e22212

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721402.

Marie Skłodowska-Curie Actions

Funded by the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No 721402