



# Status and perspectives of claims data analyses in Germany—A systematic review



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## ABSTRACT

**Background:** The aim of this article is to evaluate the status, development, and perspectives of German claims data analyses in the international and health political context.

**Methods:** We conducted a comprehensive literature search in PubMed, Scopus, and DIMDI to identify empirical and methodological articles focusing on health insurance claims data studies published between 2000 and 2014. Inclusion criteria were (1) English/German full text articles or chapters in edited books that (2) focused on the claims data of statutory health insurance funds.

**Findings:** In total, 435 articles were included. Over time, the number of claims data studies has increased strongly and the frequency of policy-relevant research types increased. Along with the historical improvement path of claims data in Germany, we observed a rising percentage of international publications and an increase in the average quality of publications. In contrast to the US or Canada where comprehensive databases have been established, the most common data source in this search was data from a single SHI fund, while databases were rarely used.

**Conclusions:** Claims data are an important source of information for healthcare stakeholders, and their use for research purposes has further increased during recent years in Germany. Despite its potential in optimising the health system, we found a lack of German comprehensive all-payer claims databases compared to the US and Canada.

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## 1. Introduction

Claims data research has a long history in Germany and worldwide. For example, in North America, claims data were analysed since the early 1980s. The United States (US) were one of the first countries to initiate claims data analyses, for instance, by utilising drug data, for research purposes and health-related political decisions [1]. In addition, in Canada, administrative healthcare

utilisation databases were used to support health policy development and the evaluation of health service delivery and quality [2]. As opposed to North America, claims data in Europe have been involved in health-related political decisions more recently. In Germany, this development started with the implementation of the Social Security Code (§ 299 SGB V) in 1988, the legal basis for statutory health insurance (SHI) funds to collect and process data as well as use them (e.g. for quality assurance) [3]. The law states that healthcare providers are committed to transmit all data on services to the SHI funds.

The development of claims data analyses can directly be linked to the historical evolution of the German healthcare system. With the introduction of the electronic health insurance card in 1995, every claim could be matched to

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the insured person individually [4]. In 1997, additional data on drug prescriptions from pharmacies were added to the databases of health insurance funds. Since 2003, data on remedies (e.g. physiotherapy) and medical aids (e.g. wheelchairs) [5] as well as on rehabilitation [6] are available in the data warehouse of the SHI funds. Before 2004, mainly information on drugs, hospitalisation, incapacity for work, sick leave payments, and demographic of insurance holders existed in German claims data [5]. However, since 2004, all resident physicians have been obliged to transmit claims data to the responsible fund via the regional Associations of Statutory Health Insurance Physicians (ASHIP), as this information is an important part of the calculation of risk structure compensation (Risikostruktureausgleich—RSA). However, general coding guidelines did not exist then. A significant development that contributed to improving the claims data research in Germany was the introduction of the DRG-system in 2005, after which extended data for inpatient care became available (from 2007) [7]. This, in turn, increased the number of diagnoses, and some researchers observed upcoding in the DRG system [8,9]. Since the introduction of RSA and the subsequent implementation of the morbidity-oriented RSA scheme in 2009, electronic data transmission has been increasingly used and physicians were obligated to code diagnoses [10–12]. Nevertheless, claims data are a valuable source of information and comprise cross-sector contacts between the insured and the healthcare system, as compared to medical records [13].

In Germany, nationwide claims data were not available in the past due to the broad number of individual SHI funds, which claims data only consist of information for their specific insured persons. In the US, developments towards an all-payer claims database (APCD) (i.e. aggregation of claims data from different SHI funds) had already started in 2000 [14]. It was only approximately 15 years later that the German Institute of Medical Documentation and Information (DIMDI) offered access to comprehensive aggregated SHI claims data based on morbidity-oriented RSA [15]. The reason for this is that not all SHI funds operate nationwide, and have the same compositions of insured persons, because it was only since 1996 that they started to have a free choice among the individual 124 SHI funds [16,17]. In contrast, the DIMDI data pool provides comprehensive data access to all SHI funds, including individual data for 86% of the German population who are covered by the SHI [18]. Access to the DIMDI data pool is regulated by the German Social Security Code (§§ 303a to 303e SGB V) and depends on the type of institution and intended use. SHI funds, the Federal Joint Committee (G-BA), representations of patients and service providers at the national/federal level, and institutions for research and healthcare reporting are among the institutions that have legal access to these data. However, it is not open for commercial use [19]. The introduction of the DIMDI data pool is a first step towards greater transparency regarding the real-life healthcare provisions in Germany. Its advantages include providing comprehensive and thus representative evaluations for all publicly insured, analysis options for service providers, a single point of contact, and ways of calculating treatment prevalence.

Prior to the introduction of the DIMDI data pool, scientific institutions had to cooperate with the individual SHI funds to get access to data and to initiate health services-related research projects. Consequently, the SHI funds were mostly, but not always, the main option for accessing scientific analyses of claims data. This development is important because claims data are becoming an increasingly important source of information for healthcare stakeholders, researchers, and policy decision makers. As a form of secondary data, in the following we refer to claims data which belong to the category of administrative data and are primarily collected for billing and reimbursement purposes. As it is acquired directly from healthcare providers, this data source could reflect real-life healthcare provisions. This data source has previously been used, for instance, for health services research [20], epidemiology studies [21], and health economic studies [22,23], and also as an input factor for modelling studies [24]. Moreover, the American National Association of Health Data Organizations emphasised that publically available claims data are an important source of information for all stakeholders making (rational) allocation decisions [14]. As Germany is one of the largest healthcare systems in the world, not only German researchers are using this data source. The RAND study is an example for international usage of German claims data [25]. In addition, international cooperation between German and foreign researchers can be found [26,27].

Therefore, claims data analyses could contribute to increasing transparency, efficiency, and thus high performing health systems [28], and could be a source to evaluate the effects of healthcare reforms and health policy changes, such as the introduction of gate-keeping [29,30], and disease management programmes (DMPs) [31–33]. Despite its historical development, little is known about the number, quality, type, and content of claims data research. In the international context, published articles using claims databases have already been reviewed (i.e. Canadian databases [2]), but in Germany, only Hoffmann [34] evaluated the use of German claims data on statutory and private health insurance, undertaking a systematic search for relevant articles published between 1998 and 2007. The review shows an increasing trend in the number of studies dealing with claims data over time. Based on 70 identified publications, the author showed that more than 50% of all the identified articles had been published within the final two years of the observation period. However, the author focused only on medications-related claims data, and his search was limited to articles published until 2007.

In sum, claims data present a powerful source of information regarding various aspects of the healthcare system. Therefore, the aim of this study is to evaluate the number, quality, type, and content of German SHI claims data for scientific purposes, health policy development, and evaluation of health service delivery and quality by presenting the findings from a comprehensive systematic literature search covering the period from 2000 to 2014. In this study, we focus only on the SHI because statutory schemes are the major source of healthcare financing. In detail, this study reflects the development of claims data analysis over time, analyses the improvement path of claims data research in Germany, discusses the methodological and conceptual

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