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ORIGINAL ARTICLE

Mental health service areas in Switzerland

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Abstract

Objectives: Small area analysis is a health services research technique that facilitates geographical comparison of services supply and utilization rates between health service areas (HSAs). HSAs are functionally relevant regions around medical facilities within which most residents undergo treatment. We aimed to identify HSAs for psychiatric outpatient care (HSA-PSY) in Switzerland.

Methods: We used HSAr, a new and automated methodological approach, and comprehensive psychiatric service use data from insurances to identify HSA-PSY based on travel patterns between patients' residences and service sites. Resulting HSA-PSY were compared geographically, demographically and regarding the use of inpatient and outpatient psychiatric services.

Results: We identified 68 HSA-PSY, which were reviewed and validated by local mental health services experts. The population-based rate of inpatient and

outpatient service utilization varied considerably between HSA-PSY. Utilization of inpatient and outpatient services tended to be positively associated across HSA-PSY.

Conclusions: Wide variation of service use between HSA-PSY can hardly be fully explained by underlying differences in the prevalence or incidence of disorders. Whether other factors such as the amount of services supply did add to the high variation should be addressed in further studies, for which our functional mapping on a small-scale regional level provides a good analytical framework.

KEYWORDS
geography, psychiatry, service use, small area analysis

1 | INTRODUCTION

Mental health services are highly complex systems with different treatment settings (e.g., inpatient and outpatient), and they often have geographically varying structures and configurations of psychiatric care (hospitals, outpatient clinics, practitioners in private practice, home treatment, etc.). This complexity makes the analysis and comparison of mental health service systems highly demanding. In Switzerland, for instance, the responsibility of 26 Cantons (Federal States) for local health services planning and a dual remuneration system with a strict distinction between outpatient and inpatient services lead to regionally diverse psychiatric care systems. Data on service use are stored in various sources (databases) and on various levels of aggregation at public federal and cantonal institutions and at private insurance companies.

Small area analysis (SAA) is a health services research technique that facilitates geographical comparison of population-based health services expenditures and utilization rates between *hospital service areas* or *health service areas* (HSAs) (Goodman & Green, 1996; Paul-Shaheen et al., 1987; Wennberg & Gittelsohn, 1973). HSAs are geographical regions around medical facilities (e.g., hospitals, outpatient clinics or physicians in private practice) within which most residents undergo treatment. In contrast to administrative units, which are typically bound to geopolitical entities (Kilaru et al., 2015), HSAs reflect the actual travel patterns of patients (patient-flows) between residence and service sites (Klauss et al., 2005) and therefore represent spatial units that are more relevant with respect to health care use and planning (functional relevance).

Comparisons of small areas have repeatedly demonstrated wide variations in health care expenditures and utilization rates—both in medical and surgical (Ashton et al., 1999; Birkmeyer et al., 1998; Chassin et al., 1986; Coyte et al., 1996; Gittelsohn & Powe, 1995; Keller et al., 1990; Knickman & Foltz, 1984; Lewis, 1969; McPherson et al., 1982; Wennberg & Gittelsohn, 1973) as well as in psychiatric services (Almog et al., 2004; Ashton et al., 1999; Curtis et al., 2009; Gottlieb et al., 2021; Hendryx & Rohland, 1994; Hendryx et al., 1995; Okumura et al., 2019; Watts et al., 2011). Such-wide variations cannot be fully explained by underlying differences in the prevalence or incidence of conditions. Whereas some areas may suffer from insufficient supply of medical care, research using SAA has repeatedly suggested the existence of supplier-induced demand for health services (Watts et al., 2011; Wennberg, 1985, 1993; Wennberg et al., 1982). Rates of medical procedures (Wennberg & Gittelsohn, 1973) and of hospitalizations for general medical illnesses (Wennberg et al., 1987) have been shown to be related more strongly to the supply of a service than to the need for that service. This raises concerns that, once the true need for a health service has been served, excess supply must be consumed by those who do not actually need the services and are therefore exposed to risks without the potential for benefit (Fisher et al., 2003; Thornicroft & Tansella, 2009). Even though the concept of supplier-induced effects was critically discussed in more recent literature (Leonard et al., 2009; Mercuri & Gafni, 2011, 2018), there is little debate that a better understanding of (geographical) variation in medical care and of its drivers may help to improve health care systems and their cost-effectiveness (Drake et al., 2008; Harrison et al., 2019).

The techniques of SAA have been underused to comprehend psychiatric services provision and use (Drake et al., 2008; Watts et al., 2011). Previous attempts to map mental health services predominately stem from the USA (Almog et al., 2004; Ashton et al., 1999; Curtis et al., 2009; Gottlieb et al., 2021; Hendryx et al., 1995; Hendryx & Rohland, 1994; Watts et al., 2011), they were often limited to specific subpopulations (e.g., insurees of the Department of Veterans Affairs) (Ashton et al., 1999; Gottlieb et al., 2021) or they predominately focused on inpatient care (Almog et al., 2004; Hendryx et al., 1995; Stocker et al., 2016; Watts et al., 2011). However, if the inpatient and the outpatient mental health care settings are considered complementary, the comprehensive study of both treatment settings is necessary to better understand mental health services systems. In many high-income countries there has been a shift from inpatient to community and outpatient care over recent decades (Thornicroft et al., 2016). Outpatient care is usually organized on a much smaller spatial scale than inpatient care (Gottlieb et al., 2021) and traveling times to service sites seems to be much more important in outpatient care (Stulz et al., 2018), making the relatively large hospital referral areas too crude a measure to capture the fine-grained regional differences in outpatient service supply and use (Eveland et al., 1998).

In this study, we therefore aimed at using SAA and health insurance data on use of outpatient services to identify HSAs across Switzerland. In a subsequent step, we combined data on inpatient service use from a different source (databases) to better understand the relationship between utilization of inpatient and outpatient services in Switzerland. The aim of this paper was to describe the application of a new and automated methodological approach (Haynes et al., 2020) to identify *psychiatric HSAs for outpatient treatment* (HSA-PSY) in Switzerland based on detailed and comprehensive psychiatric service use data. The resulting HSA-PSY were described and compared geographically, demographically and with respect to the use of inpatient and outpatient psychiatric services. These HSA-PSY, and forthcoming analyses based on them, may serve as a health care planning tool for regional authorities and foster supra-regional coordination regarding health care planning activities.

2 | METHOD

2.1 | Data sources

To delineate HSA for psychiatric outpatient services (HSA-PSY) in Switzerland, we used the pooled data of all health insurance companies in Switzerland for the most recently available years 2014–2017. Swiss health insurance data is gathered at the SASIS AG (SASIS AG, 2021) and includes information on all health services (diagnostics, therapies, and other procedures) covered by mandatory basic health insurance. For the current study, we used the following information on all outpatient mental health services recorded in the central database of the SASIS AG: Community of residence of the patient, postcode of the service provider, number of outpatient visits, year of outpatient visit, and number of service providers per postcode. The number of psychiatric outpatient visits is defined as the number of calendar days with utilization of ambulatory psychiatric services covered basic health insurance. Basic health insurance is compulsory for all residents in Switzerland and covers the costs for inpatient and outpatient medical care detailed in the Swiss Federal Law on Health Insurance (Federal Office of Public Health, 2021). Health insurers in Switzerland must ensure equal enrolment, range of services and treatment for everyone, making no distinctions on the basis of health status or other indicators. The health insurance companies in Switzerland provide detailed data on health services covered by basic insurance to the SASIS database (coverage almost 100% in 2014–2017; Schuler et al., 2020).

Whereas the SASIS database was used to delineate the HSA-PSY and to calculate outpatient service use within these HSA-PSY, the medical statistics dataset of the Federal Statistical Office (Bundesamt für Statistik, 2021a) was used to calculate hospital use (e.g., bed days per capita) per HSA-PSY. This national database includes socio-demographic, administrative and medical information (e.g., diagnoses) on all inpatient treatments provided by Swiss hospitals.

To calculate utilization rates, number of residents living in the identified area was obtained from the Federal Statistical Office for the census year 2017 (Bundesamt für Statistik, 2020).

2.2 | Delineation of HSA for psychiatric outpatient services (HSA-PSY) in Switzerland

There were two conflicting requirements when defining the HSA-PSY: On the one hand, the HSA-PSY should be as small as possible (SAA) because smaller regions tend to be more homogeneous and enable identification of differences, which are not recognizable on a more aggregated level (Tobler's first law of geography; Tobler, 1970). On the other hand, the resulting HSA-PSY should be as self-containing as possible; that is, most residents of an HSA-PSY should undergo outpatient treatment at a service site in the HSA-PSY where they live to enable comparisons between largely independent neighbouring HSA-PSY.

We delineated HSA-PSY based on outpatient data in this study. Outpatient services are usually organized on a smaller spatial scale than inpatient services and the resulting HSA-PSY therefore provide a better basis for future analyses of health services provision and use in the tradition of SAA, which calls for small and homogeneous regions. We delineated HSA-PSY based on travel flows between patients' residences and outpatient service sites using the R-Package by Haynes et al. (2020) based on the methodological approach developed by Wennberg and Gittelsohn (1973). Each patient-flow was defined by an origin (the residential political community of the patient), a destination (the postcode area of the service provider), and the size of the flow (the number of outpatient visits). To delineate HSA-PSY, we considered all psychiatric services recorded in the SASIS database, which had been provided in an outpatient setting (either in private practices or by institutional outpatient service providers).

To enable comprehensive analyses of in- and outpatient services in a later stage, we started delineation of HSA-PSY with the 706 Swiss *MedStat* regions, which are used within the context of governmental health data collection and which are the smallest common regional level on which Swiss inpatient data are recorded. The Swiss *MedStat* regions are based on aggregated postcodes and are of sufficient size to warrant anonymity of patients but they are still small enough to provide an appropriate starting point for HSA delineation (Bundesamt für Statistik, 2021b). In a first step of analysis, outpatient-flows were aggregated on the level of these MedStat regions. While service providers (destinations of patient flows) could be easily allocated to these MedStat regions based on their postcode, for patients the community of residence (but no postcode) was recorded in the SASIS database. Therefore, patients living in larger communities (i.e., cities), which comprised multiple MedStat regions, could not be unequivocally allocated to one specific MedStat region. We therefore merged MedStat regions within the same community into one overarching, synthetic MedStat region (*MedStatSyn* regions). Like-wise, in cases where the boarders of the communities were not

congruent with the boarders of postcode areas (i.e., MedStat regions), neighbouring MedStat regions were merged into overarching MedStatSyn regions if such merging increased the "congruency of the external boarder" (the fraction of buildings in a community, which could be allocated to one MedStat or MedStatSyn region, respectively, was used as measure to judge the "congruence of the external boarder"). This-step of pre-processing resulted in 563 MedStatSyn regions.

To delineate population-based HSA-PSY from patient-flows between these MedStatSyn regions, we then used the automated, reproducible and objective method developed by Haynes et al. (2020). In contrast to other approaches to delineate HSAs (Delamater et al., 2013; Franconi et al., 2017; Hu et al., 2018; Jia, 2016; Jia et al., 2017; Wang et al., 2020), this approach can also deal with regions where no interventions were performed, it allows for spatial contiguity of HSAs, and is implemented in a readily available open access program, the R package *HSAr* (Haynes, 2020). The iterative process to delineate HSA-PSY for Swiss outpatient psychiatric care providers with *HSAr* encompassed the following steps:

A. Step 1: Identify *destinations* of patient flows, that is, MedStatSyn regions with service sites (outpatient clinics or physicians in private practice).
B. Step 2: For each of these destinations (representing a potential HSA), identify all neighbouring MedStatSyn regions, which are sharing a common border with the destination region.
C. Step 3: Merge the neighbouring MedStatSyn regions with the destination region, if most patients living in the neighbouring (origin) MedStatSyn region travel to service providers in the destination region.
D. Step 4: Iterate steps 2 and 3 until all patient origin MedStatSyn regions are allocated to the neighbouring destination region (HSA) with most significant flow.
E. Step 5: Check if all MedStatSyn regions are allocated to a destination. For unallocated regions (either regions without any interventions or regions with primarily long distance flows), identify the neighbouring regions and allocate the unassigned origin region to the neighbouring HSA-PSY receiving most inflow, that is, outpatient visits (information borrowed from neighbours where necessary).
F. Step 6: Check if all HSA-PSY have a localization index (LI) greater than 50%. The LI is the fraction of all outpatient visits which the patients living in an HSA-PSY use at local psychiatric outpatient services; thus a LI > 50% reflects that patients use the majority of their psychiatric consultations in the HSA-PSY where they live. Merge HSA-PSY with an LI below this pre-defined threshold with the neighbouring HSA-PSY with the highest patient flow.
G. Step 7: Check if all HSA-PSY contain at least 6 service providers to fulfil the data owner's data protection terms. Merge HSA-PSY with less than 6 service providers with the neighbouring HSA-PSY receiving most flow.
H. Step 8: Repeat steps 5–7 until no new changes are made to the HSA-PSY allocations.

2.3 | Validation of HSA-PSY by experts

These automatically and empirically derived HSA-PSY were reviewed by a board of local mental health services experts from various parts of Switzerland. Each of these experts (including medical directors of large psychiatric institutions and other experts in mental health services research) reviewed the validity of the HSA-PSY in his or her part of Switzerland qualitatively based on the following criteria, which are not or only partly covered by the HSAr method:

- Functional relevance: Patient-flows between HSA-PSY should be minimized. While setting the LI > 0.5 in HSAr warranted that most patients undergo treatment in the HSA-PSY where they live, experts were asked to suggest merging MedStatSyn regions if, due to their experience, the automatically delineated HSA-PSY were not sufficiently self-containing (cf. criterion "relevance for health services planning").
- Small-scale areas: The HSA-PSY should be small and homogeneous to identify differences in health utilization, which are not identifiable on a more aggregated level.
- Congruence with mobility spaces: If the allocation of MedStatSyn regions to HSA-PSY was ambiguous, the resulting HSA-PSY should be in accordance with the general mobility patterns of the population as represented by the Swiss Labour Market regions (Bundesamt für Statistik, 2018).
- Relevance for health services planning: If the allocation of MedStatSyn regions to HSA-PSY was ambiguous, the HSA-PSY should facilitate effective health care planning.

The authors then optimized the empirically derived HSA-PSY manually in an iterative process with the expert panel based on the aforementioned criteria until all experts approved the resulting HSA-PSY. When manually optimizing the HSY-PSY, the data protection requirement of at least 6 service providers per HSA-PSY had to be taken into account. While this requirement was promoted by setting the number of outpatient visits per HSA-PSY in HSAr to be at least 10,000, in some cases the automatically derived HSA-PSY had nevertheless to be manually merged into overarching HSA-PSY to be in accordance with the data owner's data protection terms. Like-wise, some suggestions of experts to further split-up HSA-PSY could not be realized because resulting HSA-PSY would then have included less than 6 service providers (e.g., HSA-PSY 25 or 68 in Figure 1).

2.4 | Service use in the HSA-PSY

Finally, we calculated utilization rates of inpatient and outpatient services per 1000 population in the empirically derived HAS-PSY for the year 2017. The population-based rate of outpatient visits was then correlated with the rate of hospitalizations and with the rate of hospital bed days, respectively.
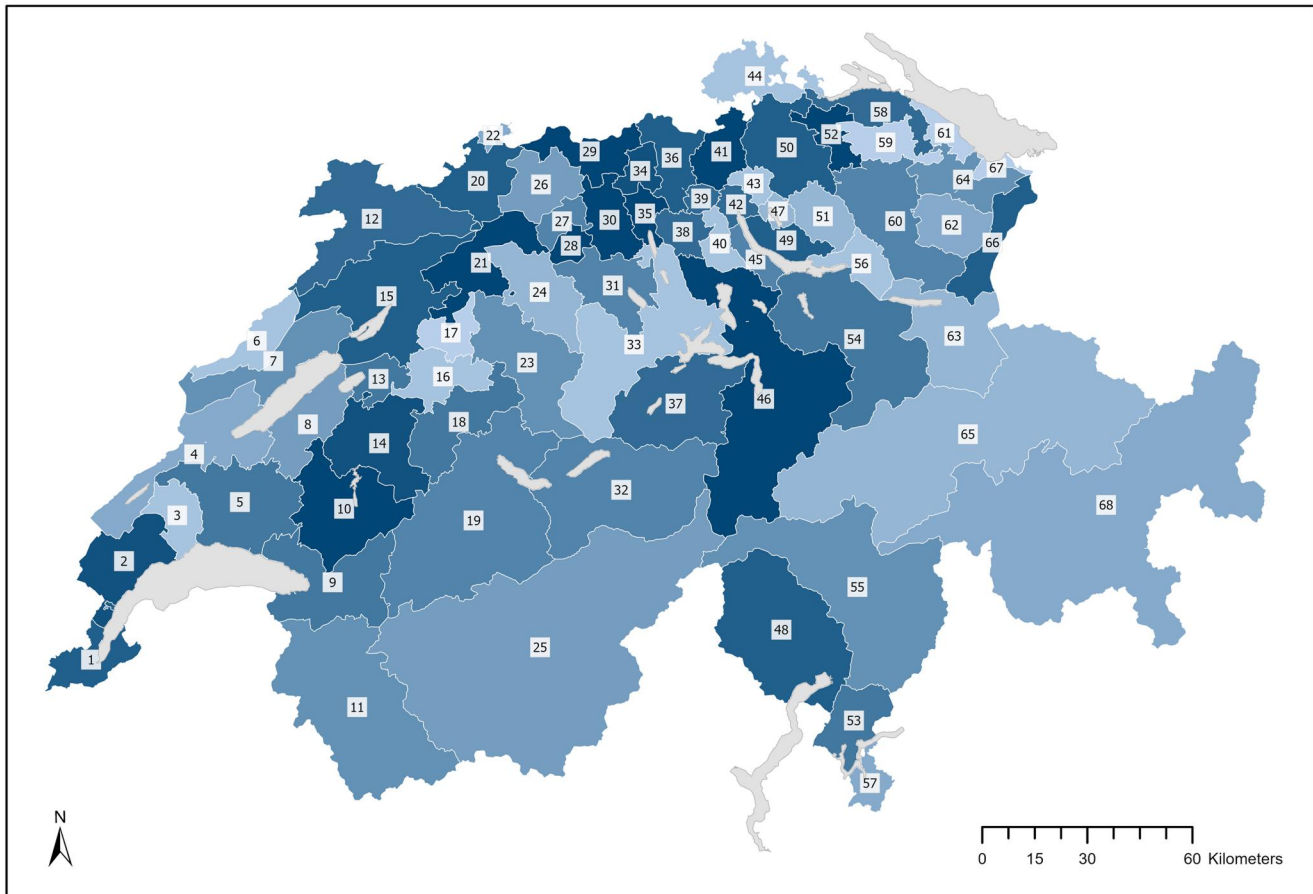
FIGURE 1 Swiss map with the 68 health service areas for psychiatric outpatient care (HSA-PSY)

3 | RESULTS

In total, there were 5,568,261 outpatient visits in the final dataset. These outpatients visits were provided at 3871 different service sites (there was at least one outpatient service provider in 382 out of the totally 563 MedStatSyn regions). On the aggregated level of these 563 MedStatSyn regions, there were 23,947 distinct flow patterns between patients' residences and outpatient service providers' sites. The size of these patient flows was indicated by the number of outpatient visits per flow. In MedStatSyn regions with less than 1000 outpatient visits in 2017, data were enriched with the number of outpatient visits in the years 2014–2016, resulting in the aforementioned 5,568,261 outpatient visits. This data enrichment step aimed at getting more reliable estimates of the magnitude of patient flows and hence spatial patterns.

3.1 | Psychiatric health services areas in Switzerland

Figure 1 depicts the 68 HSA-PSY for outpatient treatment in Switzerland (see also Table 1 for further details). These 68 HSA-PSY resulted after the 61 regions, which had been automatically delineated by HSAr, were manually modified in a post-processing step based

on the inputs of the expert panel and under consideration of data protection requirements (at least 6 service providers per HSA-PSY).

In the densely populated Swiss midlands including most of the urban areas, the area of the HSA-PSY tended to be smaller, particularly in the metropolitan area around Zurich, Switzerland's biggest city (HSA-PSY 42 in Figure 1). In the sparsely populated mountainous regions around the massive Alps, the HSA-PSY were much larger-scaled (e.g., HSA-PSY 11, 19, 25, 32, 65 and 68).

3.2 | Outpatient service use

The rate of outpatient visits varied between 242.3 and 1211.9 per 1000 population in the 68 HSA-PSY (Table 1 and Figure 2a). The median rate of the 68 HSA-PSY was 552.8 visits per 1000 population (IQR = 746.1–935.5).

3.3 | Inpatient service use

The rates of hospitalizations (Figure 2b) and hospital bed days (Figure 2c) per 1000 population again varied massively between HSA-PSY. The median rates of the 68 HAS-PSY were 8.9

TABLE 1 Description of the 68 health service areas for psychiatric outpatient care (HSA-PSY) in Switzerland

No	Name	Area (km²)	Population (2017)	Hospitalizations (2017)		Hospital bed days (2017)		Outpatient visits (2017)	
				N	Rate	N	Rate	N	Rate
1	Genève	246	496,229	3874	7.8	127,921	257.8	601,372	1212
2	Nyon	424	114,989	805	7.0	20,367	177.1	98,471	856
3	Morges	217	48,183	359	7.5	8909	184.9	38,592	801
4	Yverdon	615	82,726	721	8.7	17,591	212.6	60,315	729
5	Lausanne	692	386,061	2974	7.7	84,049	217.7	392,885	1018
6	La Chaux-de-Fonds	246	54,253	465	8.6	13,887	256.0	29,007	535
7	Neuchâtel	471	123,768	995	8.0	30,780	248.7	68,582	554
8	Payerne	367	64,576	399	6.2	10,418	161.3	35,639	552
9	Montreux	646	135,001	1251	9.3	28,259	209.3	131,202	972
10	Bulle	668	81,127	759	9.4	17,967	221.5	43,948	542
11	Monthey—Martigny	1483	131,488	1022	7.8	28,869	219.6	62,268	474
12	Jura	839	73,351	665	9.1	19,215	262.0	29,405	401
13	Murten	163	35,927	221	6.2	5968	166.1	13,347	372
14	Fribourg	557	156,372	1293	8.3	33,935	217.0	99,745	638
15	Biel	912	217,694	2051	9.4	67,526	310.2	136,549	627
16	Bern	281	272,476	2986	11.0	98,664	362.1	191,091	701
17	Münchenbuchsee	171	58,255	547	9.4	17,600	302.1	27,303	469
18	Münsingen	464	83,219	779	9.4	28,944	347.8	35,257	424
19	Thun	1702	169,907	1444	8.5	49,812	293.1	70,020	412
20	Binningen	374	227,825	2214	9.7	81,923	359.6	175,386	770
21	Solothurn	445	150,083	1774	11.8	50,412	335.9	67,926	453
22	Basel	37	193,921	3273	16.9	108,876	561.4	233,536	1204
23	Burgdorf	682	93,035	965	10.4	27,376	294.3	41,710	448
24	Langenthal	434	89,108	844	9.5	30,732	344.9	41,388	464
25	Sion—Sierre—Brig	3851	218,403	1520	7.0	46,339	212.2	62,613	287
26	Liestal	320	94,225	1059	11.2	38,935	413.2	69,257	735
27	Olten	122	66,854	712	10.7	23,187	346.8	32,354	484
28	Zofingen	89	55,797	492	8.8	17,807	319.1	22,791	408
29	Rheinfelden	283	81,638	643	7.9	22,967	281.3	49,549	607
30	Aarau	269	131,059	1244	9.5	46,372	353.8	73,492	561
31	Sursee	380	98,463	623	6.3	27,941	283.8	26,574	270
32	Interlaken	1229	47,542	436	9.2	16,516	347.4	23,966	504
33	Luzern—Entlebuch	1010	332,985	2727	8.2	109,587	329.1	119,224	358
34	Brugg	126	49,359	586	11.9	32,768	663.9	27,329	554
35	Lenzburg	122	71,437	572	8.0	20,456	286.4	34,982	490
36	Baden	285	168,401	1442	8.6	50,438	299.5	82,896	492
37	Ob- und Nidwalden	722	80,498	458	5.7	17,794	221.0	23,665	294
38	Wohlen-Bremgarten	154	76,564	581	7.6	21,229	277.3	33,056	432
39	Spreitenbach-Schlieren	66	102,564	897	8.7	28,161	274.6	55,689	543

T A B L E 1 (Continued)

No	Name	Area (km²)	Population (2017)	Hospitalizations (2017)		Hospital bed days (2017)		Outpatient visits (2017)	
				N	Rate	N	Rate	N	Rate
40	Affoltern am Albis	135	65,775	601	9.1	22,109	336.1	37,834	575
41	Bülach	242	134,289	1039	7.7	34,589	257.6	73,511	547
42	Zürich	90	411,356	4692	11.4	156,728	381.0	373,404	908
43	Wallisellen	86	122,152	1134	9.3	37,283	305.2	67,398	552
44	Schaffhausen	342	95,810	928	9.7	34,452	359.6	53,510	559
45	Thalwil	104	124,118	1064	8.6	33,870	272.9	74,237	598
46	Zug—Schwyz—Altdorf	1708	225,914	1578	7.0	59,622	263.9	67,488	299
47	Uster	63	78,821	858	10.9	29,042	368.5	50,975	647
48	Locarno	1118	69,076	649	9.4	19,160	277.4	46,282	670
49	Meilen	170	159,289	1359	8.5	48,716	305.8	106,395	668
50	Winterthur	502	234,192	2930	12.5	96,931	413.9	175,824	751
51	Wetzikon	233	89,009	873	9.8	29,237	328.5	49,561	557
52	Frauenfeld	175	61,211	672	11.0	22,324	364.7	40,700	665
53	Lugano	291	146,651	1049	7.2	36,330	247.7	92,995	634
54	Lachen—Einsiedeln—Glarus	1127	133,779	987	7.4	34,646	259.9	32,419	242
55	Bellinzona—Misox	1699	90,014	752	8.4	26,230	291.4	55,268	614
56	Rapperswil-Jona	199	63,470	413	6.5	14,658	229.3	26,913	424
57	Mendrisio	131	56,503	483	8.5	14,550	257.5	36,946	654
58	Kreuzlingen	252	65,117	717	11.0	22,222	341.3	43,965	675
59	Weinfelden	217	52,103	536	10.3	18,027	346.0	32,484	623
60	Wil	679	142,123	1387	9.7	49,960	348.6	73,811	519
61	Münsterlingen	112	65,356	908	13.9	29,843	456.6	44,392	679
62	Herisau	294	39,092	466	12.3	13,427	354.4	19,566	501
63	Sargans	628	53,988	399	7.4	13,809	255.8	21,567	399
64	St. Gallen	305	163,184	1713	10.5	62,869	385.3	98,273	602
65	Chur—Surselva—Prättigau	3038	144,916	1452	10.0	48,754	336.4	68,164	470
66	Rheintal—Werdenberg	275	92,199	693	7.5	26,422	286.6	47,009	510
67	Rorschach	48	44,824	530	11.8	19,380	432.4	26,686	595
68	Engadin—Bergell—Puschlav—Münstertal	3571	44,436	293	6.6	10,618	239.0	19,107	430

Note: Figures relate to the year 2017 and rates are per 1000 inhabitants.

(IQR = 10.0–12.2) for hospitalizations and 293.7 (IQR = 352.6–444.0) for hospital bed days.

3.4 | Association between inpatient and outpatient service use

The population-based utilization rate of outpatient services by the residents of an HSA-PSY was positively associated with the rate of hospitalizations per capita in that HSY-PSY ($p < 0.001$) and it tended to be positively associated with the utilization of hospital bed days

per capita ($p = 0.119$). However, despite these overall trends, some HSA-PSY were characterized by high outpatient and low inpatient utilization or vice versa (Figures 3a and 3b).

4 | DISCUSSION

We used SAA to delineate HSA-PSY based on flows between patients' residences and outpatient service sites in Switzerland. The resulting 68 HSA-PSY vary considerably regarding their size (area and population) but they represent functionally relevant spatial units
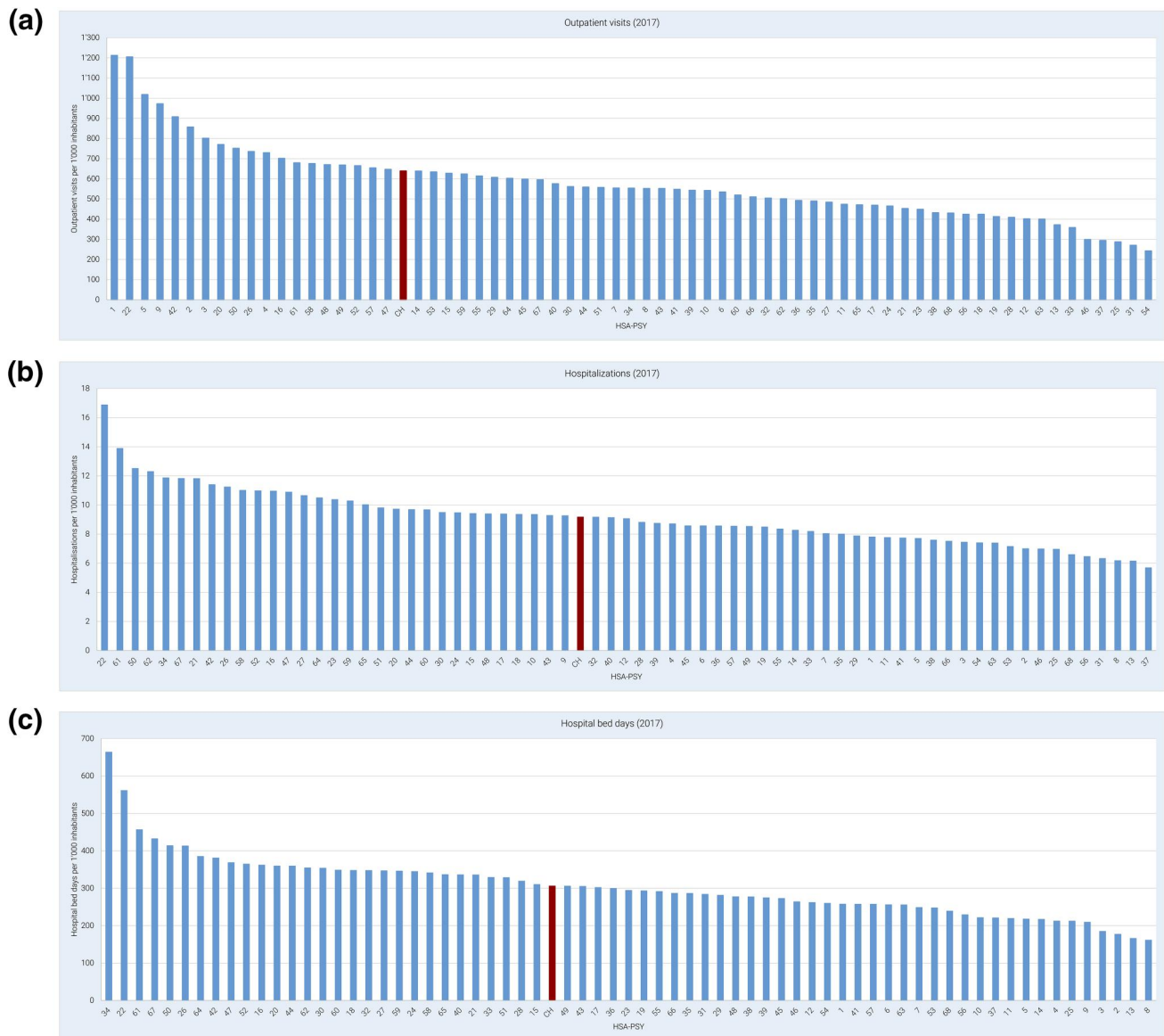
(a)

(b)

(c)

FIGURE 2 Number of (a) outpatient visits, (b) hospitalizations, and (c) hospital bed days per 1000 inhabitants and year in the 68 health service areas for psychiatric outpatient care (HSA-PSY). CH, Switzerland

for the comprehensive analysis of supply and use of inpatient and outpatient mental health services and for future service planning. So far, empirically derived and therefore functionally relevant HSA have been rarely used internationally (and never in Switzerland) to comprehensively study both inpatient and outpatient mental health services (Gottlieb et al., 2021).

Our analyses of data compiled from various sources showed a significant variation between HSA-PSY with regard to the population-based use of both psychiatric inpatient and outpatient services. It is unlikely that such wide variation in (inpatient and outpatient) service use is solely caused by different prevalence rates of mental disorders in the HSA-PSY. Whether other factors such as the amount of services supply, the population structure (e.g. age and sex) or the degree of urbanization may add to the explanation of the high variation in

the population-based service use rates between the HSA-PSY should be addressed in further studies, for which our functional mapping provides a good basis.

If one considers inpatient and outpatient mental health care to be substitutable to some degree, our findings of no or even positive associations between utilization rates of inpatient and of outpatient services appears rather counterintuitive. That is, one might expect lower use of inpatient services in HSA-PSY with higher use of outpatient services and vice versa. Even though Switzerland has one of the highest numbers of psychiatrists and one of the highest numbers of psychiatric hospital beds per capita when compared to other OECD countries (OECD, 2014), there seems still to be a gap in mental health care—particularly those patients with the most urgent need for treatment and patients in rural areas often lack access to
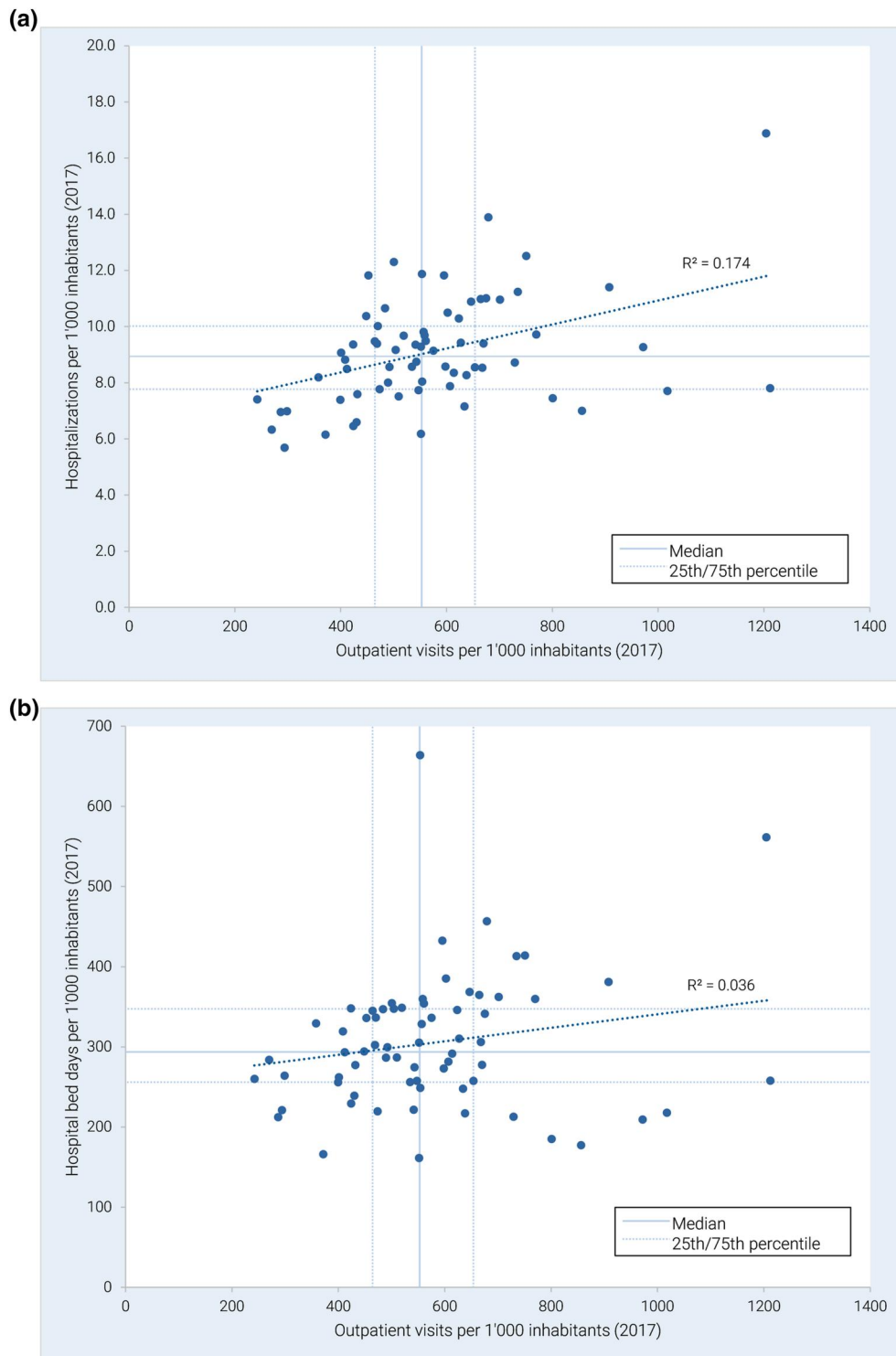
FIGURE 3 (a) Rate of hospitalizations and rate of outpatient visits per 1000 inhabitants and year in the 68 health service areas for psychiatric outpatient care (HSA-PSY). (b) Rate of hospital bed days and rate of outpatient visits per 1000 inhabitants and year in the 68 health service areas for psychiatric outpatient care (HSA-PSY)

mental health care (Stocker et al., 2016). Such treatment gap despite relatively high resources may raise the question whether psychiatric resources are appropriately allocated to patients and regions in Switzerland. While our findings suggest that there might be an under-

supply in some regions, psychiatric services might be sufficient or even overfunded in other regions. Even though the concept of supplier-induced effects was more critically discussed in more recent literature (Leonard et al., 2009; Mercuri & Gafni, 2011, 2018) and

quantifying the objective need for mental health care supply remains difficult, our findings may foster further research and the discussion for optimal allocation of resources.

As in many high income countries, a shift from inpatient to outpatient mental health care was also proclaimed by policy makers in Switzerland (Schweizerische Gesundheitsdirektorenkonferenz, 2008). However, the dual Swiss remuneration system with a strict discrimination between outpatient and inpatient health care hinders the enforcement of outpatient and intermediate (e.g., day hospital or home treatment) services. Health insurances are currently obliged to fully refund outpatient treatments whereas inpatient treatment is partly financed by both Cantons (55%) and health insurances (45%). Obviously, health insurances are therefore sparsely motivated in the strengthening of outpatient services. In addition, the current financial incentives in Switzerland often make the provision of inpatient mental health care more attractive for psychiatric institutions from an economically point of view because the actual costs of more intensive institutional outpatient services are usually not fully covered by current tariffs (which were developed to cover costs of physicians in private practice). The qualitative and/or quantitative in-depth study of those HSA-PSY with a strong focus of outpatient care (while providing relatively little inpatient care) might be an interesting endeavour for future research to learn more about the drivers and outcomes of deinstitutionalization.

4.1 | Limitations

Some limitations of the study warrant attention. In Switzerland, treatment for mental health issues is covered by basic health insurance if it is provided by psychiatric hospitals, outpatient clinics, psychiatrists in private practice or general practitioners. If costs for health services were payed out of pocket (e.g. due to deductibles) or by private health insurance models (e.g. treatment at psychologists in private practice), they were not recorded in the SASIS database and hence omitted in our analyses. Psychotherapy by psychologist was only reimbursed by basic health insurances if they were employed at psychiatric hospitals, outpatient clinics or at psychiatrists in private practice. However, out of pocket payments for psychological psychotherapy were estimated to account for less than 10% of the total costs in outpatient psychiatry (Kaiser et al., 2019) and treatment of more severe mental health issues might be covered by basic health insurance in the vast majority of cases. In addition, the data protection requirement of at least 6 service providers per HSA-PSY did sometimes prohibit delineation of small-scaled functional areas. However, this merely applied to some sparsely populated mountainous regions.

5 | CONCLUSIONS

In this study, we applied a new and automated methodological approach (HSAr) to identify HSA-PSY in Switzerland based on detailed and comprehensive psychiatric service use data from health

insurance claims. From a policy making perspective, this new approach provides an analytical framework to examine the effects of financial incentives and of regional (e.g. cantonal) mental health programs on service use by enabling comprehensive analysis of inpatient and outpatient service use on a small-scale regional level. As of midyear, psychotherapy by psychologists in private practice will also be covered by basic health insurance in Switzerland. Our HSA-PSY provide a basis for future examination of the local effects of this new national legislation. As aforementioned, further research should examine service use in patient subgroups (e.g., diagnostic and age groups) and at identifying factors, which are associated with the substantially varying amount of mental health care use between the HSA-PSY (such as services supply, degree of urbanization, socioeconomic indicators or the role of stigmatization).

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