RESEARCH ARTICLE

WILEY

Regional health disparities in Burkina Faso during the period of health care decentralization. Results of a macro-level analysis

Hilaire Zon[1,2] | Milena Pavlova[2] | Wim Groot[2,3]

[1]National Laboratory of Public Health, Ministry of Health, Ouagadougou, Burkina Faso

[2]Department of Health Services Research, CAPHRI, Maastricht University Medical Centre, Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, the Netherlands

[3]Top Institute Evidence-Based Education Research (TIER), Maastricht University, Maastricht, the Netherlands

Correspondence

Hilaire Zon, National Laboratory of Public Health, Ministry of Health, PO Box 6753, Ouagadougou, Burkina Faso.
Email: hilairezon@yahoo.fr

Summary

Background: Burkina Faso has undertaken decentralization reforms in the health care sector to improve the performance of the health system. This study aimed to analyze the differences in health outcomes by health district's demographic and economic status, and the distribution of health resources during the period of health care decentralization.

Methods: A bivariate correlation analysis was conducted using data at the health districts and regions level. Data from the health management information system (HMIS) and national households' surveys were used.

Results: The results indicate a strong correlation between district's population size and the availability of health resources ($P \leq .05$). The health visits per capita and skilled birth attendance are correlated with the economic status of the health district ($P \leq .05$). Malnutrition among under-five and maternal mortality was associated with the availability of health personnel and health infrastructures ($P \leq .05$). No correlation was found between financial resources and health outcomes.

Conclusion: The results indicated disparities in health among the health districts in Burkina Faso. The ways to address this inequality include more transparent resource allocation, as well as policies to address the socio-economic

----

disparities and financial barriers to health services. Further research is needed to collect relevant data and investigate the effects of decentralization, which was not possible in our study.

KEYWORDS

Burkina Faso, socio-economic difference, health care decentralization, health inequality, health outcomes

1 | INTRODUCTION

Health inequalities are a major source of social inequity. Several studies and reports have looked at inequality in health care in Africa.[1-11] Attempts to address health inequalities include initiatives toward universal health coverage. In many developing countries, the aim to establish universal health coverage has led to the revitalization of the public sector and promotion of the private sector through health sector reforms, with the main corollary being the decentralization of health care provision and financing.

Regarding health care decentralization, it aims to bridge the gap between providers and users in order to increase health coverage and to achieve better health outcomes through a more equitable distribution of resources and an efficiency in health services provision.[12-14]

However, the rationale for health care decentralization varies across countries. A systematic review of the evidence on the impacts of decentralization on health-related equity found that the main objective for this policy is the improvement of the overall health system performance.[15] This objective is based upon three key expectations. The first expectation is that decentralization provides the opportunity for health systems to attain both technical and allocative efficiency, empower local governments, increase accountability, and make gains in areas like quality, cost, and equity. The second expectation is imperative to make health services responsive to local population needs and to improve access and quality of health care. The third expectation is to minimize government expenditure, reduce the role of the state in the provision of health care and to introduce competition and cost-consciousness in the public sector.

In 1992, Burkina Faso has undertaken a reform of its health system, which has led to the decentralization of health care.[16] This resulted in the establishment of health regions, divided into health districts that are the operational level for implementation of the national health policy. The district health services are organized into two levels, the first of which comprises the primary health care centers that provide communities with basic preventive and curative primary health care. The second level consists of district hospitals that represent the point of referral for primary health care centers. District hospitals are managed by a district health management team and are led by a medical officer. The health district funding is largely obtained from the central government.

As part of the decentralization process, a decision was taken in 2009 by the central government to transfer the health resources and skills to local governments. These local administrative entities (called communes) are run by elected mayors that are autonomous in the management and financing of health resources without any formal hierarchical relation with the health districts. This transfer first involved primary health care centers. An institutional agreement was made to define the roles and responsibilities of each party (central government, local governments, health districts, and primary health care centers). As a result of this agreement, the local governments' roles now include the management of health care centers, procurement and supply of drugs and medical commodities, disease prevention, and sanitation. The central government only plays a regulatory role, which includes defining the national health policy and orientation, setting norms and standards for the health infrastructure, equipment, health services

functioning, and management. It also oversees health facilities and allocates financial resources through grants and subsidies to local governments.[17]

It is expected that these reforms will help to improve the overall health system performance in terms of better availability and equitable distribution of resources, increased access to good quality health services, as well as better health outcomes across health regions and health districts. It should be noted that these expectations are not solely decentralization-led as some studies[15] questioned whether decentralization leads to improvement in overall health system performance. A number of these studies report that the outcomes and benefits of decentralization are mixed, the effects of decentralization on health care are negative or ambiguous, and inequity is a major concern.[15]

The aim of this study is to analyze the regional health disparities in Burkina Faso in terms of health districts' demographics, economic status, and distribution of health resources during the period of health care decentralization. The effects of decentralization are, however, out of the scope of our study due to the lack of suitable data. We, therefore, limit our investigation to the analysis of correlations between key regional indicators over time.

We apply quantitative analytical methods based on health districts and regions level data in order to explore associations between districts' demographics and economic profile, health resources, health outcomes, and health status. The analysis is of interest for policymakers in Burkina Faso who attempt to examine the above expectations. The study helps to gauge whether the health care decentralization in Burkina Faso is on a good track to achieve the equality objective and also to provide evidence to the debate surrounding the ultimate aim of health care decentralization, namely, the improvement of service quality and coverage. The analysis is also of interest to other Sub-Saharan African countries that go through a decentralization process to revitalize the public sector while promoting the development of the private sector.

2 | METHODS

2.1 | Data collection

To assess the relationship between health districts' demographic and economic status and health outcomes, we created our own database using district and region level data in Burkina Faso. The data sources are the health management information systems and national households' surveys. These two sources provided the main representative, standardized and updated quantitative data on household's health, demographic and economic status in Burkina Faso. The data sources are described below.

2.1.1 | Health Management Information System (HMIS) reports

The HMIS reports are published yearly by the Ministry of Health to release key information and data on the health system functioning and services organization, the health services resources available and the distribution, access, utilization and coverage of health care, as well as health outcomes and health status. These reports are used to evaluate health system performances and health planning. In this study, HMIS reports were reviewed to gather the secondary data by health districts, namely demographic, health sources, health use, and outcomes data.

2.1.2 | National Household Survey reports

Two reports published by the National Statistics and Demographic Institute were used to gather secondary data on the economic profile of the 13 administrative regions which also correspond to the territorial breakdown of the

13 health regions covering the 63 health districts. These surveys are representative of the country and they involve large samples of households.

- *The 2010 Demographic and Health Survey (DHS) report*. This survey included 15 000 households and data were collected using a quantitative method. A structured questionnaire was developed to collect data on household members' characteristics, education level, health services availability and access, use of iodized salt, household's welfare indicators.
- *The 2014 Households Living Conditions Survey report*. The sample size of this survey was 10 411 households and data were collected using a quantitative survey method. A structured questionnaire was developed to collect data on household members' characteristics, education level, health, occupation, income, and housing.

The data collection points from all sources were 2010 and 2014 to allow for the changes in the socio-economic status, health services access, and health outcomes in health districts during the decentralization period, which started in 2009. The number of health districts was 63 during the period covered in the study. Another rationale for selecting the years 2010 and 2014 was the availability of data on economic characteristics collected through the national household surveys during the same periods.

The following main macro indicators were extracted from the sources described above and were used in the study:

- *Demography*: health district population estimated by the National Statistics and Demographic Institute
- Availability of health resources:
- Health personnel per capita: health personnel refers to the sum of the different categories of health personnel used in the HMIS report. These are physicians, pharmacists, midwives, nurses, and skilled birth attendants from the public sector. This ratio was expressed to 10 000 capita;
- Health infrastructure per capita: health infrastructure refers to district hospitals and primary health care centers. This ratio was expressed to 10 000 capita;
- Financial resources: these include funds allocated, funds spent, and the difference between these two;
- *Health care use and outcomes*: the number of visits to health facilities per capita per year, the percentage of skilled birth attendance, the percentage of malnutrition among under 5, and the maternal mortality ratio.
- *Poverty index and GNI coefficient*: Given that the poverty index and the GNI coefficient were not disaggregated to the district level, the profile of each region applied to all the districts in the respective region.

These indicators were selected because they are suitable for assessing health disparities/inequities. Previous studies have discussed the relevance of these indicators in measuring the geographical difference in health resources, health expenditures, utilization of health services, and health outcomes.[18-20] Specifically, these indicators provide insight into various dimensions of health inequalities. These were also the only data available in Burkina Faso for a comparison across the regions.

2.2 | Comparative quantitative analyses

Data on 1512 observations were compiled using Excel spreadsheets and analyzed with statistical package SPSS version 25 to assess the correlation between the following variables:

- *Demographic and economic characteristics*: These characteristics refer to the geographical location (urban or rural), the size of the population, the poverty index, and the GNI coefficient.
- *Availability of resources*: The resources refer to the health personnel and health infrastructures.

TABLE 1 General demographic and economic characteristics in health districts in health regions of Burkina Faso, 2010 and 2014

Health Regions/Number of Health Districts	2010			2014		
	Population[a]	Poverty index (%)[b]	GINI coefficient (%)[b]	Population[a]	Poverty index (%)[b]	GINI coefficient (%)[b]
Boucle du Mouhoun (N district = 6)						
M	264 458	12.70	8.80	295 316	20.40	25.40
(SD)	55 798	0.00	0.00	63 948	0.00	0.00
Median	268 854	12.70	8.80	299 650	20.40	25.40
Cascades (N district = 3)						
M	219 082	6.70	14.70	237 686	3.20	30.10
(SD)	63 059	0.00	0.00	100 825	0.00	0.00
Median	182 675	6.70	14.70	205 740	3.20	30.10
Centre (N district = 5)						
M	480 583	2.10	17.70	485 944	1.90	37.70
(SD)	225 293	0.00	0.00	264 298	0.00	0.00
Median	615 480	2.10	17.70	310 812	1.90	37.70
Centre Est (N district = 7)						
M	180 397	14.20	14.70	203 903	13.90	31.70
(SD)	59 254	0.00	0.00	67 821	0.00	0.00
Median	176 246	14.20	14.70	199 773	13.90	31.70
Centre Nord (N district = 4)						
M	333 715	22.10	12.70	375 749	11.80	27.90
(SD)	139 689	0.00	0.00	158 846	0.00	0.00
Median	335 666	22.10	12.70	378 222	11.80	27.90
Centre Ouest (N district = 5)						
M	262 129	19.60	16.90	293 793	11.70	26.30
(SD)	106 335	0.00	0.00	116 475	0.00	0.00
Median	233 315	19.60	16.90	264 473	11.70	26.30
Centre Sud (N district = 4)						
M	175 840	18.40	13.70	195 858	10.50	27.60
(SD)	73 582	0.00	0.00	82 982	0.00	0.00
Median	170 196	18.40	13.70	189 279	10.50	27.60
Est (N district = 6)						
M	228 206	42.14	11.00	260 691	12.60	25.10
(SD)	133 578	0.00	0.00	151 082	0.00	0.00
Median	227 860	42.14	11.00	257 411	12.60	25.10
Hauts Bassins (N district = 7)						
M	237 273	9.40	21.40	236 143	7.00	34.50
(SD)	136 008	0.00	0.00	111 953	0.00	0.00
Median	258 084	9.40	21.40	252 250	7.00	34.50
Nord (N district = 5)						
M	261 324	17.60	15.20	324 592	25.20	23.80

(Continues)

TABLE 1 (Continued)

Health Regions/Number of Health Districts	2010			2014		
	Populationª	Poverty index (%)ᵇ	GINI coefficient (%)ᵇ	Populationª	Poverty index (%)ᵇ	GINI coefficient (%)ᵇ
(SD)	122 701	0.00	0.00	130 285	0.00	0.00
Median	185 199	17.60	15.20	370 272	25.20	23.80
Plateau Central (N district = 3)						
M	254 858	13.80	12.40	284 179	12.60	24.30
(SD)	100 846	0.00	0.00	113 579	0.00	0.00
Median	261 892	13.80	12.40	291 759	12.60	24.30
Sahel (N district = 4)						
M	271 563	49.80	9.70	308 390	4.00	24.20
(SD)	92 117	0.00	0.00	104 186	0.00	0.00
Median	258 296	49.80	9.70	293 106	4.00	24.20
Sud Ouest (N district = 4)						
M	171 957	44.00	17.50	193 243	10.00	33.70
(SD)	94 254	0.00	0.00	105 618	0.00	0.00
Median	161 715	44.00	17.50	180 728	10.00	33.70

Sources of data: ªHealth Management Information System (HMIS) reports. ᵇNational Surveys on Households Leaving Conditions and Poverty.

- *Health outcomes*: The health outcomes refer to the visits to health facilities for care-seeking, coverage of selected health services, morbidity, and mortality among vulnerable groups (malnutrition among under-five and maternal mortality ratio).

Specifically, we carried out a bivariate correlation analysis to determine, on the one hand, the extent to which health districts' demographic and economic characteristics are associated with the availability of resources, as well as with health outcomes, and, on the other hand, to determine the association between the availability of resources and health outcomes. The *Pearson Test* was applied and the correlation between the variables investigated was found to be significant when *P*-value was smaller than .05 (95% CI).

3 | RESULTS

Table 1 presents the general demographic and economic characteristics in the 63 health districts in the 13 health regions.

The demographic data indicate a variation in population size across the regions. The regions with most inhabitants are the Centre, Centre Nord, Centre Ouest, Est, Haut Bassins, and Nord regions. The Centre region, which hosts the capital of the country, remains the most populated region.

We assumed that the region's economic characteristics (poverty index and GINI coefficient) pertain to all health districts within the region. Therefore, there is no variation in these characteristics within a region (SD = 0). Across the regions, the poverty index varied considerably. In 2010, the five regions with the highest poverty index were the Sahel (49.80%), Sud Ouest (44.00%), Est (42.14%), Centre Nord (22.10%), and Centre Ouest (19.60%). Compared to 2010, poverty was cut nearly in half in 2014 and the five regions with the highest poverty index were the Nord

(25.20%), Boucle du Mouhoun (20.40%), Centre Est (13.90%), Est (12.60%), and Plateau Central (12.60%). The only region that remained in the five poorest regions in 2010 as well as in 2014 was the Est region. This region has also been known as the poorest region of the country where the less well-off province is located.[21] With regard to the GINI coefficient, in 2010, it ranged from 8.80% (Boucle du Mouhoun region) to 21.40% (Hauts Bassins region), and in 2014, from 23.80% (Nord region) to 37.70% (Centre region). Thus, compared to 2010, the inequality in income indicated by the GINI coefficient was considerably higher in 2014, and it literally doubled and even tripled in some regions (Boucle Mouhoun). The two regions with the highest income inequality were the Centre and the Hauts Bassins which include the two major cities of the country.

Table 2 shows the data on the availability of health resources (financial resources, human resources, and health infrastructures).

Data on financial resources indicated some variations in financial resources allocated and financial resources spent, and particularly in the difference between these two amounts. There was an increase in health financial resources allocated to health districts between 2010 and 2014. In 2010, the mean of resources allocated ranged from $570 286 (Centre Est region) to $1 005 200 (Centre region) against $820 627 (Centre Sud region) to $1 295 463 (Centre region) in 2014. For resources spent, the means ranged from $537 143 (Centre Est region) to $970 400 (Centre region) in 2010 and from $751 928 (Centre Sud region) to $1 254 791 (Centre region) in 2014. The Centre Est and the Centre Sud regions, which received the least amount in 2010 and 2014, respectively, had the lowest expenditures. However, the Centre region with the highest amount allocated in 2010 and 2014, registered the highest expenditures in the same period. With regard to differences in resources allocated and resources spent, the region with the lowest difference in 2010 was the Boucle du Mouhoun ($29 333) and the region with the highest difference was the Centre Nord ($126 000). In 2014, the highest difference between resources allocate and spent, was the Centre Nord region ($83 014) and the lowest difference was in the Sud Ouest region ($21 469).

With regard to health personnel availability, the density of health personnel (ratio per 10 000 capita) remained far below the WHO norms set at 23 per 10 000 capita. In 2010, the mean of the health personnel ratio ranged from 4.95 in the Sahel region to 9.68 in the Sud Ouest region. In 2014, the region with the lowest health personnel ratio was still the Sahel (4.96) being one of the rearmost parts of the country, against the Centre Sud region which presented the highest health personnel ratio in 2014 (12.24).

The distribution of health infrastructure did not improve during the period. In 2010 and 2014, the Sahel region had the lowest health infrastructure ratio estimated, respectively, at 0.73 and 0.84, while the Centre region with infrastructure ratio of 2.02 and 2.03, ranked first in both years.

Overall, as indicated above, health resources were not equally distributed across the regions. The urban regions were privileged at the expense of the rural and more remoted regions, especially with regard to health personnel and health infrastructures.

Table 3 presents a range of selected indicators for health service utilization and health outcomes. The number of health visits per capita in 2010 was less than one across all regions, indicating potential underuse of health services. In 2010, the number of visits ranged from 0.49 in the Centre Nord region to 0.93 in the Centre region and from 0.65 in the Centre region to 1.01 in the Centre Est region in 2014.

The coverage of skilled birth attendance ranged from 58.40% in the Sahel region to 86.10% in the Centre region in 2010. There was a slight increase in skilled birth attendance in 2014. The lowest coverage was recorded in the Centre Sud region (73.73%) and the highest coverage in the Nord region (93.92%).

With regard to the pregnancy outcomes, the situation did not improve between 2010 and 2014 with significant variations between regions. The maternal mortality ratio ranged from 38.93 in the Sud Ouest region to 97.93 in the Boucle Mouhoun region in 2010. In 2014, the Centre Ouest region has registered the lowest maternal mortality ratio (26.78) against the Sahel region with an alarming maternal mortality ratio (151.83). The most important variation in maternal mortality ratio in 2010 was in the Centre Ouest and Nord regions and in the Centre Ouest region once again in 2014.

TABLE 2 Availability of health resources in health districts in regions of Burkina Faso, 2010 and 2014

Health Regions/ Number Health Districts	2010					2014				
	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/10 000 capita	Ratio health infrastructure/ 10 000 capita	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/ 10 000 capita	Ratio health infrastructure/ 10 000 capita
Boucle du Mouhoun (N district = 6)										
M	960 667	931 333	29 333	8.70	1.33	1 290 460	1 228 933	61 527	9.26	1.33
(SD)	172 049	160 111	12 737	1.81	0.14	205 659	242 184	67 725	1.43	0.13
Median	996 000	965 000	28 667	8.00	1.00	1 287 945	1 253 265	63 792	8.74	1.33
Cascades (N district = 3)										
M	650 667	596 667	54 000	5.66	1.32	1 079 138	1 032 410	46 728	8.62	1.35
(SD)	199 342	228 843	75 020	2.91	0.58	229 209	264 467	46 945	2.37	0.57
Median	624 000	484 000	20 000	7.17	1.59	951 286	919 656	31 630	8.01	1.48
Centre (N district = 5)										
M	1 005 200	970 400	34 800	9.60	2.02	1 295 463	1 254 791	40 672	10.44	2.03
(SD)	628 580	607 866	26 668	4.13	1.59	649 431	608 548	68 453	1.67	1.10
Median	626 000	582 000	30 000	10.33	1.74	937 174	932 678	4596	10.65	1.72
Centre Est (N district = 7)										
M	570 286	537 143	33 143	6.21	1.14	837 974	780 180	69 726	7.57	1.21
(SD)	190 061	176 007	39 036	1.41	0.20	285 419	260 894	57 578	1.84	0.25
Median	608 000	592 000	18 000	6.01	1.12	951 622	850 860	69 902	7.69	1.14
Centre Nord (N district = 4)										
M	897 500	771 500	126 000	5.48	0.98	941 202	858 188	83 014	5.27	0.97
(SD)	322 260	262 177	82 024	0.96	0.19	318 715	324 147	42 693	0.76	0.21
Median	907 000	822 000	92 000	5.32	1.01	918 029	822 996	71 137	5.28	1.06
Centre Ouest (N district = 5)										
M	750 400	692 000	58 400	7.01	1.37	1 087 087	1 009 555	77 533	6.74	1.41
(SD)	332 149	303 397	29 846	1.80	0.33	546 669	515 895	66 767	1.38	0.38

TABLE 2 (Continued)

Health Regions/ Number Health Districts	2010					2014				
	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/10 000 capita	Ratio health infrastructure/ 10 000 capita	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/ 10 000 capita	Ratio health infrastructure/ 10 000 capita
Median	734 000	688 000	54 000	6.69	1.48	1 098 977	1 059 838	66 255	6.89	1.52
Centre Sud (N district = 4)										
M	647 500	591 000	56 500	9.62	1.63	820 627	751 928	68 699	12.24	1.66
(SD)	83 096	82 793	43 186	3.43	0.33	223 605	218 511	18 021	6.69	0.38
Median	620 000	587 000	54 000	9.28	1.56	769 637	716 467	69 520	10.42	1.65
Est (N district = 6)										
M	725 333	630 333	95 000	6.15	1.01	1 004 310	937 316	66 994	6.46	0.96
(SD)	363 533	378 959	137 042	1.84	0.32	481 948	427 867	84 170	2.76	0.26
Median	630 000	428 000	41 000	5.87	0.93	1 004 669	907 163	23 736	5.77	0.90
Hauts Bassins (N district = 7)										
M	691 143	639 714	51 429	8.50	1.57	1 087 053	1 050 557	36 496	9.89	1.64
(SD)	321 490	319 742	53 587	2.26	0.57	526 779	510 333	40 384	4.86	0.90
Median	570 000	516 000	28 000	8.04	1.42	1 150 931	1 064 283	24 534	7.14	1.31
Nord (N district = 5)										
M	744 800	715 200	29 600	7.04	1.42	1 083 190	1 053 545	29 645	6.80	1.36
(SD)	212 441	201 413	11 781	0.81	0.21	396 777	374 538	32 220	1.27	0.35
Median	768 000	734 000	34 000	7.31	1.39	1 260 936	1 253 018	25 674	6.85	1.35
Plateau Central (N district = 3)										
M	832 667	792 667	40 000	8.77	1.72	1 267 649	1 227 723	39 926	10.70	1.79
(SD)	291 591	259 356	36 056	2.37	0.35	383 195	370 263	36 924	3.44	0.42
Median	954 000	884 000	50 000	8.96	1.73	1 464 523	1 430 534	25 674	12.34	1.74
Sahel (N district = 4)										
M	696 000	650 500	45 500	4.95	0.73	1 117 672	1 099 938	32 378	4.96	0.84

(Continues)

TABLE 2 (Continued)

Health Regions/ Number Health Districts	2010					2014				
	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/10 000 capita	Ratio health infrastructure/ 10 000 capita	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/ 10 000 capita	Ratio health infrastructure/ 10 000 capita
(SD)	326 537	303 541	34 732	0.39	0.09	230 946	229 260	1420	0.32	0.11
Median	653 000	594 000	41 000	4.88	0.72	1 139 195	1 112 067	32 318	5.07	0.87
Sud Ouest (N district = 4)										
M	616 500	574 500	42 000	9.68	1.50	885 316	826 954	21 649	10.00	1.58
(SD)	147 814	148 937	24 386	2.76	0.07	256 888	206 059	2353	3.29	0.15
Median	610 000	555 000	41 000	10.16	1.52	778 932	739 279	21 844	10.01	1.64

Sources of data: Health Management Information System (HMIS) Report.

TABLE 3 Selected health outcomes in health districts in health regions of Burkina Faso, in 2010 and 2014

Health Regions/ Number of Health Districts	2010				2014			
	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio
Boucle du Mouhoun (N district = 6)								
M	0.59	83.02	4.68	97.93	0.74	91.33	14.75	68.12
(SD)	0.16	2.81	1.68	43.59	0.09	6.22	6.67	35.28
Median	0.52	82.55	4.84	101.77	0.73	91.42	14.63	71.11
Cascades (N district = 3)								
M	0.54	74.47	5.20	60.10	0.86	87.13	8.43	29.57
(SD)	0.08	20.26	1.95	46.09	0.14	13.26	0.40	18.43
Median	0.56	67.00	5.10	66.10	0.90	88.60	8.50	37.50
Centre (N district = 5)								
M	0.93	86.84	4.02	55.12	1.00	91.92	3.64	29.02
(SD)	0.17	16.95	1.73	39.80	0.19	30.99	2.03	26.71
Median	0.99	84.40	4.70	43.60	0.94	97.20	2.80	29.70
Centre Est (N district = 7)								
M	0.80	79.60	3.57	53.03	1.01	86.10	9.03	40.00
(SD)	0.08	7.74	1.57	41.63	0.07	11.91	4.50	12.94
Median	0.82	81.00	3.30	45.30	1.02	86.60	7.60	41.40
Centre Nord (N district = 4)								
M	0.49	66.00	8.80	57.15	0.65	83.30	18.15	36.93
(SD)	0.08	9.44	1.69	33.31	0.13	10.51	13.14	27.37
Median	0.50	62.85	9.30	45.55	0.64	85.60	17.05	42.90
Centre Ouest (N district = 5)								
M	0.54	66.80	5.30	90.12	0.72	74.80	21.54	26.78
(SD)	0.14	5.04	2.22	95.15	0.12	11.85	5.15	26.89
Median	0.55	67.50	4.60	76.80	0.79	75.60	21.80	27.70

(Continues)

TABLE 3 (Continued)

Health Regions/ Number of Health Districts	2010				2014			
	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio
Centre Sud (N district = 4)								
M	0.67	81.15	8.23	74.70	0.86	73.73	3.90	49.75
(SD)	0.04	10.62	3.67	18.44	0.13	5.96	3.41	45.72
Median	0.66	76.95	8.60	75.80	0.83	73.55	2.35	41.30
Est (N district = 6)								
M	0.54	65.32	6.68	85.58	0.81	79.27	13.50	64.15
(SD)	0.09	5.98	1.78	73.79	0.14	12.62	8.80	34.16
Median	0.53	62.75	6.05	79.95	0.83	73.00	10.70	75.80
Hauts Bassins (N district = 7)								
M	0.59	80.01	5.73	54.07	0.83	89.44	6.16	40.56
(SD)	0.12	11.09	4.95	48.49	0.16	14.64	6.00	34.78
Median	0.61	85.30	2.70	50.70	0.88	94.60	3.80	35.30
Nord (N district = 5)								
M	0.72	79.58	17.18	64.40	0.81	93.92	37.02	60.88
(SD)	0.21	15.43	8.47	71.16	0.18	12.40	15.48	26.12
Median	0.65	74.10	18.30	44.50	0.73	91.80	36.90	69.80
Plateau Central (N district = 3)								
M	0.72	83.10	3.10	50.53	0.92	81.97	9.23	68.27
(SD)	0.03	6.65	1.82	13.56	0.08	14.12	2.10	53.90
Median	0.72	84.70	2.20	57.60	0.94	80.40	8.50	37.50
Sahel (N district = 4)								
M	0.59	58.40	14.63	92.45	0.86	77.83	19.33	151.83
(SD)	0.29	24.93	4.56	59.05	0.34	26.43	11.99	72.64
Median	0.57	55.55	15.75	101.35	0.85	76.75	21.00	181.35

TABLE 3 (Continued)

Health Regions/ Number of Health Districts	2010				2014			
	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio	Number of health visits / capita/y	Skilled birth attendance (%)	Malnutrition under 5 (%)	Maternal mortality ratio
Sud Ouest (N district = 4)								
M	0.60	61.48	6.90	38.93	0.86	77.73	10.13	31.93
(SD)	0.05	16.09	3.10	27.58	0.13	14.46	10.31	20.71
Median	0.58	60.00	6.90	46.85	0.83	81.35	5.95	28.70

Sources of data: Health Management Information System (HMIS) report.

TABLE 4 Health districts demographic and economic characteristics and availability of resources in Burkina Faso, 2010 and 2014

		2010					2014				
		Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/ 10 000 capita	Ratio health infrastructure/ 10 000 capita	Financial resources allocated ($)	Financial resources spent ($)	Difference ($)	Ratio health personnel/ 10 000 capita	Ratio health infrastructure/ 10 000 capita
Population size	Correlation Pearson Test	.778**	.754**	.239	−.282*	−.072	.742**	.723**	.324**	−.280*	−.064
Poverty index	Correlation Pearson Test.	−.142	−.177	.160	−.226	−.355**	−.013	−.021	.061	−.120	−.152
GINI coefficient	Correlation Pearson Test	−.107	−.097	−.069	.228	.318*	−.027	−.022	−.041	.296*	.347**

**P < .05.
*P < .1.

TABLE 5 Health districts demographic and economic characteristics and health outcomes in Burkina Faso, 2010 and 2014

		2010				2014			
		Number of visit per capita/year	Skilled birth attendance (%)	Malnutrition among under 5 (%)	Maternal mortality	Number of visits per capita/y	Skilled birth attendance (%)	Malnutrition among under 5 (%)	Maternal mortality
Populationsize	Correlation Pearson Test	−.006	.040	.035	−.165	−.099	−.115	.068	.054
Poverty index	Correlation Pearson Test	−.329**	−.544**	.326**	.097	−.196	.113	.509**	.030
GINI coefficient	Correlation Pearson Test	.155	.134	−.130	−.226	.307*	.120	−.512**	−.389**

**P < .05.

*P < .1.

TABLE 6 Availability of resources and health outcomes in districts in Burkina Faso, 2010 and 2014 (n = 63)

		2010				2014			
		Number of visits per capita/y	Skilled birth attendance (%)	Malnutrition among under 5 (%)	Maternal mortality	Number of visits per capita/y	Skilled birth attendance (%)	Malnutrition among under 5 (%)	Maternal mortality
Financial resources allocated (US $)	Correlation Pearson Test	−.041	.056	.045	−.019	.105	−.055	−.059	.128
Financial resources spent ($)	Correlation Pearson Test	.011	.089	.029	−.013	.129	−.029	−.049	.131
Difference ($)	Correlation Pearson Test	−.267*	−.159	.092	−.034	−.146	−.200	−.091	.017
Ratio health personnel/10 000 capita	Correlation Pearson Test	.367**	.230	−.117	.037	.297*	−.001	−.282*	−.133
Ratio health infrastructure/10 000 capita	Correlation Pearson Test	.411**	.108	−.160	−.119	.301*	−.234	−.205	−.308***

*P < .1.

The proportion of under-five undernourished ranged from 3.10% in the Plateau Central region to 17.18% in the Nord region in 2010. This proportion ranged from 3.64% in the Centre region to 37.02% in the Nord region in 2014. The most important variation was observed in the Sud Ouest region in 2014.

Tables 4-6 present the results of the statistical analysis using bivariate correlations to investigate the relationship between the district demographic, socio-economic characteristics, and health outcomes.

Table 4 presents the correlation analysis of the health district's demographic and economic characteristics, and the availability of resources. The results indicate a strong correlation between district's population size and the availability of human resources for health, as well as health infrastructures ($P < .05$). We also found that a decrease in health personnel and health infrastructures ratio per capita is correlated with an increase in the population size and the poverty index ($P < .05$). A moderate correlation was found between the GINI coefficient and the health personnel, and health infrastructures ratio per capita ($P < .10$).

Table 5 shows the correlation between the health district's demographic and economic characteristics and health outcomes. The results indicate that the key health outcomes were correlated ($P < .05$) with the economic status of health districts. The poverty index increases, the number of health services visits per capita, and the percentage of skilled birth attendance decline, while the malnutrition among under-five recorded an increase. No correlation was found between the population size and health outcomes.

Table 6 provides the results of the correlation analysis of health resources and health outcomes. It can be inferred that health services visits are correlated with the availability of health infrastructures and health personnel. The number of visits per capita increases with the increase in the ratio of health personnel and health infrastructure per capita ($P < .05$). The results also suggest that malnutrition among under-five and maternal mortality decline when the ratio of health personnel and health infrastructure per capita increase ($P < .05$). No correlation is found between the financial resources and health outcomes.

4 | DISCUSSION

In this study, we used secondary regional-level data to analyze the relationship between health districts' demographic and economic status, and health outcomes, using a bivariate correlation analysis. We first determined the correlation between the health district's demographic and economic characteristics, on the one side, and the availability of resources and health outcomes, on the other side. Secondly, we determined the correlation between the availability of resources and health outcomes.

The results indicate sizeable variation in the population and poverty index across the regions and a variation in health resources and health outcomes across health districts. While the poverty index declined between 2010 and 2014, the inequality in income between regions has significantly increased during the same period. With regard to health resources, the data suggest inequality in their distribution, that is, urban regions are more privileged than rural regions, which also record poorer health outcomes.

The findings show an increase in health financing which is a favorable trend. However, this progress is unequally distributed across health districts highlighting the unfairness in the allocation of health financial resources. Another major finding of our study is the relationship between health resources (personnel and health infrastructures), the population size and the poverty index. This suggests that an increase in poverty and population size is associated with a decrease in health personnel and health infrastructure ratio, thus showing that the poorest and the most populated health districts are less likely to have an optimal level of health personnel and health infrastructure that are key for ensuring adequate health services coverage.

This reflects the failure of the health resources allocation policy to distribute health resources in a fair and equal manner across the country, thereby contributing to deepened inequality between urban and rural regions, as well as between well-off and poorest regions.

Regional and district disparities were observed before the start of the health care decentralization as well. A study on the health sector reform in Burkina Faso conducted about two decades ago,[22] found that there was a strong urban bias to public spending on health, with 70% of funds being directed to the 16% of the population that was urban, leaving 30% for the remaining 84% rural population. Part of the bias in the distribution of financial resources was reflected by the inequitable distribution of human resources, with 57% of physicians, 65% of pharmacists, 55% of midwives, and 47% of nurses being deployed in the two main cities of the country.[22]

Ten years later, another study showed that this situation remained unchanged. Specifically, in a policy note, Zida et al[23] identified the key issues in resource allocation in Burkina Faso, which were the failure to account for problems encountered by health facilities, the health status of the population, and the existing health system problems. The resources were allocated using a historical allocation key, which did not reflect the programs' performance and the population health's needs, resulting in poor performance of programs, multiplicity of resources allocation methods, poor access to health services, high morbidity, and mortality. These findings were similar to the results of a study for Ghana, which suggested that equity in resources allocation should consider the difference between health regions and the difference within the region as well.[24]

Regarding the relationship between health outcomes and the economic performance of the health districts, this study found that a higher poverty rate was associated with less access to health services (health visits, skilled birth attendance decline) and poorer health status (more malnutrition among under five). It was also found that health services visits, malnutrition among under five, and maternal mortality were associated with the availability of health personnel and health infrastructures. The correlation between poverty and health has been widely explored in developing countries, including Burkina Faso, and the economic status was found to be associated with health care access.[10,25,26] A review on inequalities in health care use and expenditures in eight developing countries and countries in transition revealed that richer groups had a higher probability of obtaining care when sick, to be more likely to be seen by a medical doctor, and to have a higher probability of receiving medicines when ill, than the poorer groups.[5] The inequity in malnutrition among under five[27] and inequalities in infant and under-five mortality[28] had to do with households' income.

There is broad agreement that inequality is unfair, avoidable, and concerns everyone.[1,29] The causes or drivers of inequality are manifold and its resolution suggests a more in-depth understanding toward equitable access to health services. Previous studies on health sector reform in Burkina Faso showed that the main causes of the unfair distribution of health resources are the over-centralization of resources leading to allocative and technical inefficiencies.[22] The over-centralization of resources, particularly for investments and staff recruitment, was found to be a barrier to equitable resource allocation at the health district level although the district's managers could have the option to decide over district's health priorities and to readjust resources allocation.[30] A study for Ghana indicated that equity in the allocation of resources within regions had been virtually ignored, creating a vacuum in knowledge regarding how resources were allocated intra-regionally and their potential influence on promoting health equity.[24] The resource allocation method was found to be the main driver of inequity in resource allocation across geographic areas. The equity of funding allocation was greatly influenced by the availability of human resources for health, local capacity to utilize funds, donor involvement in the health sector, and commitment to promote equity.

As mentioned in the introduction, the decentralization of health care was aimed to increase health services provision and access in order to improve equitably the services coverage and population's health status across the health districts and health regions. The study findings show that the equality objective in health was not achieved in the period of health care decentralization in Burkina Faso. In relation to the issue of decentralization and health-related equity, a systematic review found that depending on the context, decentralization could either lead to equity gains or exacerbate inequities.[15] It can lead to inequities in health financing between sub-national jurisdictions. However, the impact of decentralization on inequities in health and health care depends on pre-existing socio-economic disparities and financial barriers to access. This suggests that addressing inequality between health districts and health regions would require the reduction of the gap between poor and rich, and the removal of financial barriers that impede equitable access to health services.

The selected indicators, although relevant to assess the health disparities, present some limitations because each indicator quantifies a different perspective of inequity. It is therefore imperative to consider how an indicator operationalizes inequities. In particular, it will be advantageous to determine and use a comprehensive set of indicators for a robust assessment of health inequities.[20] This was not possible in our study because the availability of data comparable across the regions is limited in Burkina Faso.

5 | STUDY LIMITATIONS

The study used secondary data from the health management information system (HMIS) and national households' survey to carry out a bivariate correlation analysis, which presents four main limitations. First, the health management information system reports are official statistics published by the Ministry of Health that mainly focus on health facilities. They are not able to capture individual-level details relevant to the wider population. Second, the measurement instruments used for the preparation of these reports have changed over time, making it difficult to perform a period-to-period comparison, as well as comparison across health regions and health districts. Third, some potential misinterpretation and samples representativeness issues might have occurred given our inability to control data quality and data interpretation. This could interfere with the statistical analysis. Fourth, the aim of the study was not to assess the effects of decentralization on the health system or on health. Therefore, the results should not be referenced as an evaluation of the decentralization impact on health inequality in Burkina Faso.

6 | CONCLUSION

Through this study, we explored the relationship between health districts' demographics, economic status, and health outcomes in Burkina Faso. The results indicated demographic and economic differences in health outcomes between health districts, thus showing an inequality in health among health districts. The main underlying causes or drivers of inequality are the economic difference among the population, the health resources allocation policy, and methods that should promote equity among and within the different geographical entities.

The study has taken place in the context of decentralization in Burkina Faso, but it did not have the necessary data to link the results with the direct effect of the decentralization reform. However, it can be noted that the health and health care outcomes changed during the decentralization. Therefore, from a decentralization policy perspective, the findings suggest challenges in addressing the inequality between regions and districts to eliminate the inequality related factors and therefore enhance the equity in health services access, coverage and outcomes. This requires a more transparent resource allocation system based on regions and districts' needs considering the decentralization system, policies to address the socio-economic disparities and financial barriers to health services. A consideration should be given to a health inequality monitoring system to be able to determine the root causes of inequity and identify feasible approaches to address these causes.[19]

Further research is needed to collect relevant data and investigate the effects of decentralization, which was not possible in our study.

CONFLICT OF INTEREST

The authors whose names are listed above certify that they have NO conflicts of interests to report and are not affiliated with or involved in any organization or entity with any financial interest (such as honoraria; educational

grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

COMPLIANCE WITH ANIMAL/HUMAN ETHICS GUIDELINES

Our research does not require any human/animal subjects to acquire a research ethics board approval.

ORCID

Hilaire Zon 🄳 https://orcid.org/0000-0002-9138-9909

REFERENCES

1. WHO. The World Health Report: Health Systems Financing: The Path to Universal Coverage. The World Health Organization 2010. ISBN 978 92 4 068480 5.
2. Ataguba JE, James AJ, McIntyre D. Socioeconomic-related health inequality in South Africa: evidence from General Household Surveys. *Int J Equity Health*. 2011;10:48.
3. Heaton T, Crookston B, Hayley P, Acheampong YA. Social inequality and children's health in Africa: a cross sectional study. *Int J Equity Health*. 2016;15:92. https://doi.org/10.1186/s12939-016-0372-2.
4. Pillay-van V, Bradshaw D. Mortality and socioeconomic status: the vicious cycle between poverty and ill health. *Lancet*. 2017;5(9):pe851-e852.
5. Makinen M, Waters H, Rauch M, et al. Inequalities in health care use and expenditures: empirical data from eight developing countries and countries in transition. *Bull World Health Organ*. 2000;78(1).
6. Mwase T, Brenner S, Mazalale J, et al. Inequities and their determinants in coverage of maternal health services in Burkina Faso. *Int J Equity Health*. 2018;17(58). https://doi.org/10.1186/s12939-018-0770-8.
7. Okolo CO, Reidpath DD, Allotey P. Socioeconomic inequalities in access to health care: examining the case of Burkina Faso. *J Health Care Poor Underserved*. 2011;22(2):663-682.
8. Gwatkin DR. Health inequalities and the health of the poor: what do we know? What can we do? *Bull World Health Organ*. 2000;78(1).
9. Su T, Kouyaté B, Steffen F. Catastrophic household expenditure for health care in a low-income society: a study from Nouna District, Burkina Faso. *Bull World Health Organ*. 2006;84(1):21-27.
10. Bado AR, Susuman S. Decomposing wealth-based inequalities in under-five mortality in West Africa. *Iran J Public Health*. 2015;44(7):920-930.
11. Shankar P, Kumar R. Reducing health inequities in a generation: a dream or reality? *Bull World Health Organ*. 2009;87:84-84.
12. Litvack J, Junaid A, Bird R. Rethinking decentralization in Developing Countries. World Bank sector studies series 1998, ISBN0-8213-4350-5.
13. Saltman R, Bankauskaite V, Vrangbæk K. *Decentralization in Health Care, Strategies and Outcomes*.
14. Rondinelli A, John R, Nellis G, Cheema S. Decentralization in developping countries. World Bank Staff Working Papers number 581, Management and Development Series number 8. 1983.
15. Sumah AM, Baatiema L, Abimbola S. The impacts of decentralization on health-related equity: a systematic review of the evidence. *Health Policy*. 2016 Oct;120(10):1183-1192. https://doi.org/10.1016/j.healthpol.2016.09.003.
16. Haddad S, Nougtara A, Fournier P. Learning from health system reforms: lessons from Burkina Faso. *Trop Med Int Health*. 2006 Dec;11(12):1889-1897.
17. Ministère de l'Aménagement du Territoire et de la Décentralisation (MATD) Burkina Faso. Evaluation Globale des Compétences et des Ressources Transférées de l'Etat aux Communes [in French] 2014; Rapport d'études.
18. Dlouhy M. Measuring geographic inequalities: dealing with multiple health resources by data envelopment analysis. *Front Public Health*. 6(53). https://doi.org/10.3389/fpubh.2018.00053.
19. Hosseinpoor AR, Bergen N, Schlotheubera A, Grovea J. Measuring health inequalities in the context of sustainable development goals. *Bull World Health Organ*. 2018;96:654-659. https://doi.org/10.2471/BLT.18.210401.
20. Olakunle A, David P. Utility and limitations of measures of health inequities: a theoretical perspective. *Glob Health Action*. 2015;8:27591. https://doi.org/10.3402/gha.v8.27591.
21. Programme des Nations Unies pour Développement (PNUD/UNDP), Burkina Faso. Cartographie de la pauvreté et des inégalités au Burkina Faso, 2014.
22. Bodart C, Servais G, Yansané M, Schmidt B. The influence of health sector reform and external assistance in Burkina Faso. *Health Policy Plan*. 16(1):74-86.

23. Zida A, Ouédraogo S, Kouyaté B. *Stratégies d'amélioration des allocations budgétaires pour la santé au Burkina Faso (Note de politique SURE)*. Ouagadougou, Burkina Faso: Ministère de la santé; 2010. www.evipnet.org/sure.

24. Danso AA, Zwi AB, Ho MT. Equity in resource allocation for health: a comparative study of the Ashanti and Northern Regions of Ghana. *Health Policy*. 2006;78:135-148.

25. Bado AR, Susuman S. Determinants of under-5 mortality in Burkina Faso. *J Public Health*. 41. https://doi.org/10.1093/pubmed/fdy168.

26. WHO. The state of inequality: reproductive, maternal, newborn and child health. Global Health Expenditures database. World Health Organization (WHO). 2015. Accessed October 5, 2018. https://apps.who.int/nha/database/Select/Indicators/en

27. Zere E, McIntyre D. Inequities in under-five child malnutrition in South Africa. *Int J Equity Health*. 2003;2:7.

28. Wagstaff A. Socioeconomic inequalities in child mortality: comparisons across nine developing countries. *Bull World Health Organ*. 2000;78(1).

29. Woodward A, Kawachi I. Why reduce health inequalities? *J Epidemiol Community Health*. https://doi.org/10.1136/jech.54.12.923.

30. Von E, Savadogo B. Choix des priorités et allocation des ressources dans le système de santé du Burkina Faso : centres et pouvoirs de décision. Medicus Mundis Scheweiz Bulletin #91. December 2003.