

Supplemental Documents

Table S1. Normal test of health financing indicators.

Variable	1995-1999				2000-2014				2015-2019			
	P(skewness)	P(kurtosis)	Joint test		P(skewness)	P(kurtosis)	Joint test		P(skewness)	P(kurtosis)	Joint test	
			Adj chi2(2)	P			Adj chi2(2)	P			Adj chi2(2)	P
THS	<0.001	<0.001	47.16	<0.001	<0.001	<0.001	141.64	<0.001	<0.001	<0.001	52.11	<0.001
GHS	<0.001	<0.001	49.31	<0.001	<0.001	<0.001	115.45	<0.001	<0.001	<0.001	41.00	<0.001
PPHS	<0.001	0.0016	29.69	<0.001	<0.001	<0.001	73.77	<0.001	<0.001	0.0019	27.82	<0.001
OOPHS	<0.001	<0.001	48.22	<0.001	<0.001	<0.001	146.95	<0.001	<0.001	<0.001	53.94	<0.001
DAH	<0.001	0.0057	19.58	0.0001	<0.001	<0.001	160.04	<0.001	<0.001	<0.001	46.04	<0.001
THS/PC	<0.001	0.0199	18.97	0.0001	<0.001	<0.001	89.80	<0.001	<0.001	<0.001	41.46	<0.001
GHS/PC	<0.001	<0.001	51.22	<0.001	<0.001	<0.001	116.72	<0.001	<0.001	<0.001	50.74	<0.001
PPHS/PC	<0.001	<0.001	42.34	<0.001	<0.001	<0.001	84.71	<0.001	<0.001	0.0002	32.16	<0.001
OOPHS/PC	<0.001	0.0025	20.05	<0.001	<0.001	<0.001	48.18	<0.001	0.2647	0.0890	4.26	0.1186
DAH/PC	<0.001	<0.001	65.80	<0.001	<0.001	<0.001	114.40	<0.001	<0.001	<0.001	47.43	<0.001
THS/GDP	<0.001	0.0024	24.60	<0.001	<0.001	<0.001	86.49	<0.001	<0.001	<0.001	45.75	<0.001
GHS/GDP	<0.001	<0.001	37.21	<0.001	<0.001	0.0188	33.30	<0.001	<0.001	0.0057	22.19	<0.001
PPHS/GDP	0.0025	0.0583	10.67	0.0048	<0.001	0.0057	32.97	<0.001	0.1484	0.0038	9.04	0.0109
OOPHS/GDP	<0.001	0.0012	26.83	<0.001	<0.001	<0.001	75.55	<0.001	0.0001	0.0599	15.13	0.0005
DAH/GDP	<0.001	<0.001	72.37	<0.001	<0.001	<0.001	156.51	<0.001	<0.001	<0.001	59.53	<0.001
GHS/THS	<0.001	0.0001	33.96	<0.001	<0.001	0.0037	32.53	<0.001	0.0097	0.5541	6.52	0.0385
PPHS/THS	0.0711	0.6034	3.67	0.1599	<0.001	0.0029	32.89	<0.001	<0.001	0.0067	21.55	<0.001
OOPHS/THS	0.0036	0.2689	8.50	0.0143	0.4169	<0.001	30.21	<0.001	0.6514	0.9605	0.21	0.9019
DAH/THS	<0.001	0.0001	30.88	<0.001	<0.001	0.0020	38.15	<0.001	0.0001	0.0381	15.45	0.0004

Adj chi2(2) – chi-square value; THS – Total Health Spending; GHS – Government Health Spending; PPHS – Prepaid Private Health Spending; OOPHS – Out-of-pocket Health Spending; DAH – Development Assistance for Health; THS/PC – Total Health Spending per person; GHS/PC – Government Health Spending per person; PPHS/PC – Prepaid Private Health Spending per person; OOPHS/PC – Out-of-pocket Health Spending per person; DAH/PC – Development Assistance for Health per person; THS/GDP – Total Health Spending per Gross Domestic Product; GHS/GDP – Government Health Spending per Gross Domestic Product; PPHS/GDP – Prepaid Private Health Spending per Gross

Domestic Product; OOPHS/GDP – Out-of-pocket Health Spending per Gross Domestic Product; DAH/GDP – Development Assistance for Health per Gross Domestic Product; GHS/THS – Government Health Spending per Total Health Spending; PPHS/THS – Prepaid Private Health Spending per Total Health Spending; OOPHS/THS – Out-of-pocket Health Spending per Total Health Spending; DAH/THS – Development Assistance for Health per Total Health Spending.

Table S2. The association between health financing and HLE in West Africa, 1995-2019: estimated from spatial panel data models with main effects by using different spatial weight matrix.

Health financing component	Variables	Panel	SDM	DSDMlag1	DSDMlag2	DSDMlag3	
Health financing level	Overall level	THS	-10.71(-22.09,0.66)	0.6(-4.78,5.98)	-3.7(-6.98,-0.42)‡	3.65(-1.43,8.73)	-3.58(-6.91,-0.25)‡
		GHS	7.8(2.37,13.22)‡	-1.68(-3.61,0.24)	0.42(-0.79,1.63)	-2.21(-4.04,-0.38)‡	0.42(-0.78,1.62)
		PPHS	-1.1(-3.03,0.83)	-1.79(-2.55,-1.02)‡	-0.17(-0.64,0.31)	-1.43(-2.14,-0.71)‡	-0.17(-0.64,0.3)
		OOPHS	2.02(-8.08,12.12)	18.39(13.44,23.34)‡	3.88(0.67,7.09)‡	14.8(10.04,19.56)‡	3.86(0.66,7.06)‡
		DAH	4.21(2.22,6.19)‡	-0.88(-1.52,-0.24)‡	0.33(-0.12,0.78)	0.14(-0.56,0.84)	0.33(-0.12,0.78)
	Per capita level	THS/PC	-0.12(-0.55,0.31)	-0.18(-0.3,-0.06)‡	-0.03(-0.1,0.04)	-0.17(-0.28,-0.06)‡	-0.03(-0.1,0.04)
		GHS/PC	0.49(0.04,0.95)‡	0.02(-0.11,0.15)	0.03(-0.05,0.1)	0(-0.12,0.12)	0.02(-0.05,0.1)
		PPHS/PC	-1.33(-1.87,-0.78)‡	0.19(-0.01,0.39)	0.1(-0.02,0.22)	0.28(0.1,0.46)‡	0.1(-0.02,0.22)
		OOPHS/PC	0.18(-0.25,0.61)	0.04(-0.08,0.16)	0.02(-0.06,0.09)	0.03(-0.08,0.15)	0.02(-0.06,0.09)
		DAH/PC	0.35(-0.08,0.77)	0.13(0.01,0.25)‡	0.02(-0.05,0.09)	0.11(0,0.22)	0.02(-0.05,0.09)
	Per GDP level	THS/GDP	-29.01(-76.65,18.62)	2.39(-12.07,16.85)	4.88(-4.13,13.89)	-2.04(-16.01,11.93)	4.68(-4.35,13.7)
		GHS/GDP	-97.65(-183.76,-11.55)‡	-12.25(-37.29,12.79)	1.08(-13.69,15.84)	-4.07(-26.87,18.73)	1.19(-13.52,15.9)
		PPHS/GDP	-43.57(-203.72,116.58)	-12.5(-66.44,41.44)	-21.08(-53.64,11.47)	-29.47(-79.73,20.8)	-21.45(-53.88,10.99)
		OOPHS/GDP	29.98(-35.24,95.2)	-19.48(-39.66,0.69)	-1.46(-13.77,10.85)	-25.27(-44.03,-6.51)‡	-1.57(-13.83,10.69)
		DAH/GDP	-116.86(-187.01,-46.72)‡	0.41(-19.47,20.29)	11.5(-0.52,23.53)	0.2(-18.31,18.7)	11.52(-0.45,23.49)
Health financing structure	Government	GHS/THS	-0.94(-47.59,45.72)	19.36(6.65,32.06)‡	-1.12(-8.8,6.56)	20.79(9.17,32.41)‡	-0.95(-8.65,6.74)
	Nongovernment	PPHS/THS	137.57(87.73,187.41)‡	24.7(9.26,40.15)‡	-4.17(-13.55,5.2)	20.13(5.86,34.4)‡	-3.97(-13.38,5.44)
		OOPHS/THS	21.73(-23.15,66.61)	0.18(-11.92,12.28)	-3.46(-10.78,3.85)	4.16(-7.18,15.5)	-3.3(-10.64,4.03)
External assistance	DAH/THS	34.03(-10.93,78.99)	12.39(0.23,24.55)‡	-1.75(-9.04,5.53)	12.33(1.15,23.51)‡	-1.6(-8.9,5.69)	
Constant		20.85(-23.97,65.68)	-	-	-	-	

(t-1) × HLE	-	-	0.87(0.8,0.93)	-	0.86(0.79,0.93)
(t-1)w × HLE	-	0.28(0.24,0.32)	-	-0.76(-1.03,-0.5)	-0.03(-0.22,0.17)

Panel – ordinary panel data model; SDM – spatial panel Durbin model; DSDMlag1 – spatial panel Durbin mode with time lagged regressors; DSDMlag2 – spatial panel Durbin mode with space- time lagged regressors; DSDMlag3 – spatial panel Durbin mode with time and space-time lagged regressors; t – the study period 1995-2019; w – the spatial weight matrix at country level; ‡*P*<0.05; THS – Total Health Spending; GHS – Government Health Spending; PPHS – Prepaid Private Health Spending; OOPHS – Out-of-pocket Health Spending; DAH – Development Assistance for Health; THS/PC – Total Health Spending per person; GHS/PC – Government Health Spending per person; PPHS/PC – Prepaid Private Health Spending per person; OOPHS/PC – Out-of-pocket Health Spending per person; DAH/PC – Development Assistance for Health per person; THS/GDP – Total Health Spending per Gross Domestic Product; GHS/GDP – Government Health Spending per Gross Domestic Product; PPHS/GDP – Prepaid Private Health Spending per Gross Domestic Product; OOPHS/GDP – Out-of-pocket Health Spending per Gross Domestic Product; DAH/GDP – Development Assistance for Health per Gross Domestic Product; GHS/THS – Government Health Spending per Total Health Spending; PPHS/THS – Prepaid Private Health Spending per Total Health Spending; OOPHS/THS – Out-of-pocket Health Spending per Total Health Spending; DAH/THS – Development Assistance for Health per Total Health Spending.

Table S3. The association between health financing and HLE in West Africa, 1995-2019: estimated from spatial panel data models with spatial lagged effects by using different spatial weight matrix.

Health financing component	Variables	Panel	SDM	DSDMlag1	DSDMlag2	DSDMlag3
Health financing level	Overall level	THS	15.79(4.06,27.53)‡	-6.87(-14.21,0.48)	23.4(12.32,34.49)‡	-6.52(-14.06,1.03)
		GHS	9.37(4.73,14.02)‡	3.42(0.56,6.28)‡	5.21(0.77,9.66)‡	3.36(0.48,6.23)‡
		PPHS	1.31(-0.14,2.76)	0.19(-0.72,1.09)	0.18(-1.22,1.57)	0.16(-0.74,1.06)
		OOPHS	-14.78(-25.7,-3.86)‡	6.12(-0.84,13.07)	-9.97(-20.49,0.55)	6.16(-0.77,13.08)
		DAH	0.08(-1.19,1.35)	-0.99(-1.81,-0.16)‡	-0.18(-1.45,1.09)	-0.99(-1.81,-0.17)‡
	Per capita level	THS/PC	-0.39(-0.66,-0.13)‡	-0.01(-0.17,0.15)	-0.43(-0.68,-0.18)‡	-0.01(-0.18,0.15)
		GHS/PC	-0.08(-0.36,0.2)	-0.02(-0.19,0.15)	-0.1(-0.36,0.16)	-0.02(-0.18,0.15)
		PPHS/PC	0.56(0.13,0.98)‡	0.31(0.05,0.56)‡	0.7(0.3,1.09)‡	0.31(0.06,0.57)‡
		OOPHS/PC	0.47(0.2,0.75)‡	-0.02(-0.19,0.15)	0.47(0.22,0.73)‡	-0.02(-0.19,0.15)
		DAH/PC	0.26(0,0.52)	0.01(-0.14,0.17)	0.28(0.04,0.53)‡	0.02(-0.14,0.17)
	Per GDP level	THS/GDP	-5.72(-35.92,24.48)	1.59(-16.84,20.03)	-28.36(-56.73,0.02)	1.24(-17.21,19.69)
		GHS/GDP	71.65(23.59,119.7)‡	13.6(-15.07,42.28)	70.04(26.29,113.79)‡	14.02(-14.57,42.6)

		PPHS/GDP	-191.86(-323.44,-60.28)‡	-48.81(-129.46,31.84)	-211.37(-334.08,-88.66)‡	-49.58(-129.88,30.71)
		OOPHS/GDP	-20.23(-57.41,16.95)	-11.73(-34,10.54)	-37.43(-72.42,-2.44)‡	-12.66(-35.31,9.99)
		DAH/GDP	24.27(-19.77,68.31)	10.8(-15.85,37.44)	14.57(-26.69,55.84)	10.48(-16.14,37.1)
Health financing structure	Government	GHS/THS	5.61(-18.01,29.24)	-2.92(-17.03,11.19)	15.95(-5.86,37.75)	-2.6(-16.74,11.53)
	Nongovernment	PPHS/THS	1.65(-27.35,30.65)	-17.18(-34.72,0.35)	11.08(-16.09,38.24)	-16.67(-34.32,0.99)
		OOPHS/THS	13.95(-9.45,37.35)	0.3(-13.96,14.56)	12.24(-9.72,34.19)	0.31(-13.89,14.5)
	External assistance	DAH/THS	6.56(-16.09,29.2)	2.36(-11.05,15.77)	9.93(-10.77,30.64)	2.48(-10.88,15.84)
	ρ	-	-0.37(-0.52,-0.21)	0.02(-0.1,0.15)	0.09(-0.1,0.28)	0.01(-0.15,0.18)
	R ²	0.64	0.95	0.98	0.93	0.98
	AIC	1603.17	643.24	247.66	543.43	249.24
	BIC	1680.33	797.56	404.16	699.93	409.56
	Log-likelihood	-	-281.62	-308.95	-1145.34	-321.62

Panel – ordinary panel data model; SDM – spatial panel Durbin model; DSDMlag1 – spatial panel Durbin mode with time lagged regressors; DSDMlag2 – spatial panel Durbin mode with space- time lagged regressors; DSDMlag3 – spatial panel Durbin mode with time and space-time lagged regressors; t – the study period 1995-2019; w – the spatial weight matrix at country level; ‡P<0.05; THS – Total Health Spending; GHS – Government Health Spending; PPHS – Prepaid Private Health Spending; OOPHS – Out-of-pocket Health Spending; DAH – Development Assistance for Health; THS/PC – Total Health Spending per person; GHS/PC – Government Health Spending per person; PPHS/PC – Prepaid Private Health Spending per person; OOPHS/PC – Out-of-pocket Health Spending per person; DAH/PC – Development Assistance for Health per person; THS/GDP – Total Health Spending per Gross Domestic Product; GHS/GDP – Government Health Spending per Gross Domestic Product; PPHS/GDP – Prepaid Private Health Spending per Gross Domestic Product; OOPHS/GDP – Out-of-pocket Health Spending per Gross Domestic Product; DAH/GDP – Development Assistance for Health per Gross Domestic Product; GHS/THS – Government Health Spending per Total Health Spending; PPHS/THS – Prepaid Private Health Spending per Total Health Spending; OOPHS/THS – Out-of-pocket Health Spending per Total Health Spending; DAH/THS – Development Assistance for Health per Total Health Spending.

Table S4. Direct and Indirect effects decomposition during long-term of HLE associated and health financing by using different spatial weight matrix in West Africa, 1995-2019.

Health financing component		Variables	Direct	Indirect	Total
Health financing level	Overall level	THS	-28.75(-106.19,48.69)	-50.01(-984.05,884.03)	-78.76(-1081.8,924.27)
		GHS	3.11(-18.5,24.72)	27.4(-184.84,239.64)	30.51(-198.64,259.66)
		PPHS	-1.22(-5.68,3.25)	1.77(-20.05,23.6)	0.56(-23.4,24.52)
		OOPHS	29.38(-14.04,72.8)	49.84(-310.02,409.7)	79.22(-311.07,469.51)
		DAH	2.93(-3.79,9.64)	-8.35(-41.31,24.62)	-5.42(-41.18,30.34)
	Per capita level	THS/PC	-0.21(-1.11,0.68)	0.18(-8.64,8.99)	-0.03(-9.51,9.44)
		GHS/PC	0.21(-0.48,0.9)	-0.15(-3.18,2.89)	0.06(-3.35,3.47)
		PPHS/PC	0.69(-1.89,3.26)	1.94(-30.11,34)	2.63(-31.71,36.97)
		OOPHS/PC	0.1(-0.86,1.06)	-0.45(-10.55,9.65)	-0.35(-11.19,10.49)
		DAH/PC	0.13(-0.67,0.92)	-0.04(-6.7,6.61)	0.09(-7.1,7.27)
	Per GDP level	THS/GDP	39.04(-144.6,222.68)	-36.58(-2385.51,2312.36)	2.46(-2512.36,2517.28)
		GHS/GDP	2.48(-134.79,139.74)	125.48(-387.42,638.39)	127.96(-452.09,708.01)
		PPHS/GDP	-152.51(-560.38,255.36)	-323.12(-4514.13,3867.89)	-475.63(-4982.52,4031.26)
		OOPHS/GDP	-9.44(-126.47,107.6)	-94.62(-384.41,195.16)	-104.06(-436,227.87)
		DAH/GDP	91.07(-86.08,268.22)	61.78(-1834.78,1958.33)	152.85(-1882.75,2188.45)
Health financing structure	Government	GHS/THS	-6.78(-79.46,65.9)	-34.06(-279.34,211.22)	-40.84(-328.05,246.37)
	Nongovernment	PPHS/THS	-28.68(-184.52,127.16)	-125.99(-1884.48,1632.5)	-154.67(-2044.8,1735.46)
		OOPHS/THS	-23.37(-100.25,53.5)	12.92(-612.52,638.37)	-10.45(-686.14,665.23)
	External assistance	DAH/THS	-11.46(-81.01,58.08)	24.54(-312.45,361.53)	13.08(-361.69,387.85)

‡ $P < 0.05$; THS – Total Health Spending; GHS – Government Health Spending; PPHS – Prepaid Private Health Spending; OOPHS – Out-of-pocket Health Spending; DAH – Development Assistance for Health; THS/PC – Total Health Spending per person; GHS/PC – Government Health Spending per person; PPHS/PC – Prepaid Private Health Spending per person; OOPHS/PC – Out-of-pocket Health Spending per person; DAH/PC – Development Assistance for Health per person; THS/GDP – Total Health Spending per Gross Domestic Product; GHS/GDP – Government Health Spending per Gross Domestic Product; PPHS/GDP – Prepaid Private Health Spending per Gross Domestic Product; OOPHS/GDP – Out-of-pocket Health Spending per Gross Domestic Product; DAH/GDP – Development Assistance for Health per Gross Domestic Product; GHS/THS

– Government Health Spending per Total Health Spending; PPHS/THS – Prepaid Private Health Spending per Total Health Spending; OOPHS/THS – Out-of-pocket Health Spending per Total Health Spending; DAH/THS – Development Assistance for Health per Total Health Spending.

Table S5. Direct and Indirect effects decomposition during short-term of HLE associated and health financing by using different spatial weight matrix in West Africa, 1995-2019.

Health financing component		Variables	Direct	Indirect	Total
Health financing level	Overall level	THS	-3.76(-6.99,-0.52)‡	-6.9(-14.27,0.47)	-10.66(-19.89,-1.42)‡
		GHS	0.47(-0.69,1.64)	3.44(0.54,6.35)‡	3.92(0.44,7.39)‡
		PPHS	-0.17(-0.62,0.29)	0.18(-0.73,1.1)	0.01(-1,1.03)
		OOPHS	3.86(0.87,6.85)‡	6.08(-0.44,12.6)	9.94(2.07,17.81)‡
		DAH	0.34(-0.1,0.77)	-1(-1.82,-0.18)‡	-0.66(-1.7,0.37)
	Per capita level	THS/PC	-0.03(-0.11,0.05)	-0.01(-0.17,0.15)	-0.04(-0.23,0.16)
		GHS/PC	0.02(-0.05,0.1)	-0.02(-0.19,0.16)	0.01(-0.2,0.22)
		PPHS/PC	0.1(-0.02,0.22)	0.3(0.05,0.55)‡	0.4(0.11,0.69)‡
		OOPHS/PC	0.02(-0.06,0.09)	-0.02(-0.19,0.15)	-0.01(-0.21,0.19)
		DAH/PC	0.02(-0.06,0.09)	0.01(-0.14,0.17)	0.03(-0.16,0.22)
	Per GDP level	THS/GDP	5.1(-4.34,14.54)	0.65(-17.89,19.18)	5.75(-15.37,26.87)
		GHS/GDP	0.54(-13.99,15.06)	12.95(-15.13,41.03)	13.48(-20.32,47.29)
		PPHS/GDP	-21.09(-54.95,12.76)	-48.44(-125.43,28.56)	-69.53(-167.67,28.61)
		OOPHS/GDP	-1.68(-14.28,10.93)	-11.08(-32.49,10.33)	-12.76(-38.31,12.8)
		DAH/GDP	11.53(-0.31,23.36)	9.94(-15.56,35.44)	21.47(-8.52,51.45)
Health financing structure	Government	GHS/THS	-0.78(-8.4,6.83)	-2.93(-17.24,11.39)	-3.71(-21.45,14.03)
	Nongovernment	PPHS/THS	-3.93(-13.51,5.64)	-17.18(-34.41,0.05)	-21.12(-43.01,0.78)
		OOPHS/THS	-3.03(-10.44,4.37)	0.37(-13.57,14.31)	-2.66(-19.92,14.59)
	External assistance	DAH/THS	-1.36(-8.66,5.95)	2.43(-10.96,15.81)	1.07(-15.53,17.67)

‡ $P < 0.05$; THS – Total Health Spending; GHS – Government Health Spending; PPHS – Prepaid Private Health Spending; OOPHS – Out-of-pocket Health Spending; DAH – Development Assistance for Health; THS/PC – Total Health Spending per person; GHS/PC – Government Health

Spending per person; PPHS/PC – Prepaid Private Health Spending per person; OOPHS/PC – Out-of-pocket Health Spending per person; DAH/PC – Development Assistance for Health per person; THS/GDP – Total Health Spending per Gross Domestic Product; GHS/GDP – Government Health Spending per Gross Domestic Product; PPHS/GDP – Prepaid Private Health Spending per Gross Domestic Product; OOPHS/GDP – Out-of-pocket Health Spending per Gross Domestic Product; DAH/GDP – Development Assistance for Health per Gross Domestic Product; GHS/THS – Government Health Spending per Total Health Spending; PPHS/THS – Prepaid Private Health Spending per Total Health Spending; OOPHS/THS – Out-of-pocket Health Spending per Total Health Spending; DAH/THS – Development Assistance for Health per Total Health Spending.