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Trends of Authorship Equity in Global Health Research in Infectious Disease Over the Past Two Decades

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By

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Bachelor of Science
Fudan University
2018

Thesis Advisor: David Benkeser, PhD

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Biostatistics
2020

Abstract

Trends of Authorship Equity in Global Health Research in Infectious Disease Over the Past Two Decades

By Qiao Deng

Abstract

Background: Building research capacity in low-income countries (LICs) has been paid increasing attention over the years, given the idea that local research capacity may be an important means of strengthening health systems in a LIC. The goal of this study is to evaluate whether global research capacity development is improving over the period 1998-2017.

Methods: This study conducted a systematical review in research articles about infectious diseases from three well-known infectious disease journals (Clinical Infectious Diseases, Journal of Infectious Diseases, and Open Forum Infectious Diseases) from 1998 to 2017. The institutional affiliation, funding source, disease, region, and year of publication, etc. were included as key variables. Logistic regression was applied to explore the impact of these key variables on LIC first- or last-authorship (FA/LA) over the period.

Results: A total of 1,323 individual papers were identified as research articles in infectious disease, of which 513 (46.67%) had FA or LA from a LIC. The number of publications each year since 1999 remains stable, whereas the percentage of publications with LIC FA/LA is decreasing in general. The odds ratio of having a LIC FA/LA versus not having a LIC FA/LA for a paper published paper in infectious disease in the three selected journals is 0.97 (95%CI: [0.95, 0.99]). 1097 (82.92%) of total identified researches were carried out in Africa, and the percentage of publications with LIC FA/LA is also decreasing in general, with the odds ratio of having a LIC FA/LA versus not having a LIC FA/LA for a paper published paper in infectious disease in the three selected journals is 0.97 (95%CI: [0.95, 1.00]).

Conclusion: The percentage of publications in infectious disease in the three journals in varying over the time, and appearing a descending trend, showing that in general, the authorship equity disparities may be growing worse, and more efforts should be taken.

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Trends of Authorship Equity in Global Health Research in Infectious Disease Over the Past Two Decades

Qiao Deng

Supervisor: David Benkeser

Introduction

Global health broadly pertains to the study, research and practices that lead to the improvement of health and health equity worldwide.[1] In the past two decades, there has been explosive growth in research in this area, often involving collaborative research projects that include scientists from both high-income countries (HIC) and low-income countries (LIC). These researchers work together to understand local culture, environment and diseases to solve complex issues in health care[2] with the hope that beneficial medical knowledge can be brought to LIC. An example of success in this strategy is the development of culturally appropriate, efficacious interventions aimed at preventing HIV infection and providing effective therapy for individuals infected with HIV.[3 - 4]

However, advancing medical knowledge is only one aspect of global health. Recently researchers have additionally focused on building research capacity in LIC, with the idea that local research capacity may be an important means of strengthening health systems in a LIC. [5] The necessity to take research capacity into consideration stems from the fact that, while LICs experience the heaviest burden of disease, researchers from the countries are relatively underrepresented in medical research. [6] Even if there is an absolute increase in the quantity of research and first author in LIC, the increasing trend is slight compared to that of authors from non–LIC. [7] Indeed, a recent study showed that researchers from HICs were responsible for the highest proportion of biomedical publications during 1990 - 2000, while researchers from LICs enjoyed first

authorship in less than 1% of biomedical publications.[8] Other studies have reported that only 14% of publications on community health workers were led by LICs during 2012 - 2016, and the trend of the proportions of LIC first/last authors remained relatively static over time. [8] Possible explanations for the limited research capacity in LIC include a shortage of qualified researchers and local funding resources, inadequate facilities, or insufficient experience of local researchers in international publication [10].

Equitable authorship may be valuable for building LIC research capacity as it often influences decisions in hiring, promotion, and grant applications[11]. However, motivation for research capacity-building amongst HIC scientists may be limited by the fact that academic evaluations are typically measured by funding and first/last author research publications. Thus, HICs may not prioritize improving research capacity in a LIC.[12]

In the face of these issues, it is of interest to investigate whether global research capacity development is improving over a long period of time. To evaluate this question, we selected three well-known infectious disease journals (*Clinical Infectious Diseases*, *Journal of Infectious Diseases*, and *Open Forum Infectious Diseases*), which are generally held in high esteem in this research area. We collected information on all published papers based on research that took place in a LIC during 1998 - 2017, including the funding source, country of first and last author's affiliation. We used this information to quantify and visualize trends in authorship over time and better understand the overall change in research leadership.

Methods

Inclusion criteria

The study focused on infectious diseases in that they pose great challenges to improving the health environment of population in poverty, and have influenced economic

development profoundly. The following criteria were used to determine eligible studies: (i) published in either of the three infectious journals (*Clinical Infectious Diseases*, *Journal of Infectious Diseases*, and *Open Forum Infectious Diseases*) in the period from 1998 to 2017; (ii) conducted in a LIC or LICs with participation from local population; (iii) funding source was disclosed.

Data extraction

After the application of inclusion criteria, there were a total of 1,323 individual papers. Information pertaining to study geography region, journal, year of publication, disease type, affiliations of first author (FA) and last author (LA), and funding source were extracted.

The LIC first-authorship and last-authorship variables (1/0: yes/no) were created based on institutional affiliations of the researcher. Researchers with either LIC FA or LIC LA were classified as being from a LIC. Geographic regions of studies were organized into: Africa, Asia-Pacific, Eastern-Europe, Latin America and Caribbean.

Analysis

We examined the proportion of studies with first or last author from LIC by year of publication, journal, geographic region (overall and just in Africa), disease type, funding area. We used spine plots (Rstudio Version 1.1) to explore these trends. In these plots, the bars are shaded according to whether the study had a first or last author from a LIC FA/LA, while the width of each bar represents the number of papers in each subgroup. These analyses were repeated for LIC FA and LIC LA separately.

We used logistic regression to examine the association between disease type, funding source, geography region, and year of publication on the probability of LIC first/last-authorship (yes/no). Diseases were categorized into HIV, Malaria, NTD, and Other. Any disease with proportion less than 10 percent of the total was collapsed into the

Other category. Funding sources were categorized into United States, United Kingdom, International, and Other sources, where any source with the proportion less than 5 percent was collapsed to Other. We fit these regressions using the whole data set, and then again stratified by disease type and geographic region. Geographic regions were categorized into Africa, and Asia-Pacific, and Other region, since the majority of the research collected took place in these two regions. The reference groups for each category are: other disease types, other funding sources, other geography regions, and year 0.

Rstudio 1.1.463 for Mac OS X 10_15_2 was used to conduct data analysis and graphs. Rstudio package "graphics" was used to conduct the spine plots to illustrate the change of LIC research number by year, region, African area separately.

Results

Overall, 513 (46.67%) of individual papers had FA or LA from a LIC. Table 1 shows the characteristics of papers overall and stratified by LIC authorship. We found that the number of papers published each year has remained relatively stable since 1999. A majority of studies published in the three selected journals are from Africa, and the rest are mainly from Asia-Pacific. Most of papers are from *Clinical Infectious Diseases* and *Journal of Infectious Diseases*. The most popular disease types of all the researches include Malaria (25.77%), HIV (20.18%), and Neglected tropical diseases (NTD) (10.58%).

Table 1. Descriptive Characteristics of collected papers

	Category	Overall (%)	FA / LA LIC (%)	FA & LA HIC (%)
Year	1998	5(0.38)	5(0.38)	0(0.00)
	1999	41(3.10)	22(1.66)	19(1.44)
	2000	63(4.76)	35(2.65)	28(2.12)
	2001	58(4.06)	33(2.49)	25(1.89)
	2002	57(4.31)	25(1.89)	32(2.42)

	2003	81(6.12)	48(3.63)	33(2.49)
	2004	67(5.06)	38(2.87)	29(2.19)
	2005	89(6.73)	44(3.33)	45(3.40)
	2006	81(6.12)	40(3.02)	41(3.10)
	2007	61(4.61)	24(1.81)	37(2.80)
	2008	81(6.12)	42(3.17)	39(2.95)
	2009	88(6.65)	46(3.48)	42(3.17)
	2010	73(5.52)	36(2.72)	37(2.80)
	2011	64(4.84)	31(2.34)	33(2.49)
	2012	88(6.65)	47(3.55)	41(3.10)
	2013	66(4.99)	27(2.04)	39(2.95)
	2014	51(3.85)	27(2.04)	24(1.81)
	2015	67(5.06)	27(2.04)	40(3.02)
	2016	81(6.12)	34(2.57)	47(3.55)
	2017	61(4.61)	23(1.74)	38(2.87)
Geo Region	African	1097(82.92)	514(38.85)	583(44.07)
	Asia-Pacific	198(14.97)	125(9.45)	73(5.52)
	Eastern European	14(1.06)	10(0.76)	4(0.30)
	Latin American and Caribbean	14(1.06)	5(0.38)	9(0.68)
Journal	Clinical Infectious Diseases	402(30.39)	240(18.14)	162(12.24)
	Journal of Infectious Diseases	887(67.04)	397(30.01)	490(37.04)
	Open Forum Infectious Diseases	34(2.57)	17(1.28)	17(1.28)
Primary Disease	Respiratory illness	69(5.22)	57(4.31)	12(0.91)
	Malaria	341(25.77)	160(12.09)	181(13.68)
	NTD	140(10.58)	63(4.76)	77(5.82)
	Tuberculosis	79(5.97)	42(3.17)	37(2.80)
	HIV	267(20.18)	105(7.94)	162(12.24)
	Diarrheal illness	86(6.50)	48(3.63)	38(2.87)
	Meningitis	48(3.63)	27(2.04)	21(1.59)
	Ebola	37(2.80)	7(0.53)	30(2.27)
	Other	256(19.35)	145(10.96)	111(8.39)
Funding Area	States	1(0.08)	1(0.08)	0(0.00)
	International	488(36.89)	215(16.25)	273(20.63)
	Kingdom	5(0.38)	5(0.38)	0(0.00)
	Kenya	6(0.45)	3(0.23)	3(0.23)
	Pakistan	1(0.08)	1(0.08)	0(0.00)
	United States	109(8.24)	46(3.48)	63(4.76)
	None Listed	392(29.63)	215(16.25)	177(13.38)
	Canada	21(1.59)	11(0.83)	10(0.76)
	Denmark	10(0.76)	4(0.30)	6(0.45)

	Mexico	2(0.15)	1(0.08)	1(0.08)
	Japan	8(0.60)	5(0.38)	3(0.23)
	Not Listed	3(0.23)	2(0.15)	1(0.08)
	United Kingdom	177(13.38)	101(7.63)	76(5.74)
	Netherlands	13(0.98)	4(0.30)	9(0.68)
	Germany	8(0.60)	1(0.08)	7(0.53)
	France	23(1.74)	11(0.83)	12(0.91)
	Switzerland	5(0.38)	1(0.08)	4(0.30)
	Ireland	2(0.15)	0(0.00)	2(0.15)
	Ethiopia	1(0.08)	1(0.08)	0(0.00)
	China	3(0.23)	0(0.00)	3(0.23)
	Spain	7(0.53)	7(0.53)	0(0.00)
	Australia	8(0.60)	4(0.30)	4(0.30)
	India	9(0.68)	7(0.53)	2(0.15)
	Israel	1(0.08)	0(0.00)	1(0.08)
	Taiwan	2(0.15)	2(0.15)	0(0.00)
	Sweden	3(0.23)	2(0.15)	1(0.08)
	New Zealand	1(0.08)	1(0.08)	0(0.00)
	Kuwait	1(0.08)	0(0.00)	1(0.08)
	Norway	3(0.23)	0(0.00)	3(0.23)
	Nepal	1(0.08)	1(0.08)	0(0.00)
	Portugal	1(0.08)	0(0.00)	1(0.08)
	Bangladesh	1(0.08)	1(0.08)	0(0.00)
	Haiti	1(0.08)	0(0.00)	1(0.08)
	Finland	2(0.15)	0(0.00)	2(0.15)
	Italy	3(0.23)	1(0.08)	2(0.15)
	Saudi Arabia	1(0.08)	0(0.00)	1(0.08)
Total		1323(100)	654(49.43)	669(50.57)
African Area	West Africa	343(31.27)	154(14.04)	189(17.23)
	East Africa	628(57.25)	313(28.53)	315(28.71)
	North Africa	8(0.73)	4(0.36)	4(0.36)
	Central Africa	38(3.46)	10(0.91)	28(2.55)
	South Africa	74(6.75)	32(2.92)	42(3.83)
Total		1091*(99.45)	513(46.76)	578(52.69)

*Six of the African papers did not indicate African areas. (We have 1097 African papers, here only 1091 have African area.)

Figure 1 shows trends in authorship over time. Here we observe that the proportion of papers with LIC FA/LA has apparently decreased from 1998 to 2017. Figure 3 shows the distribution of region of publications, and displays the difference of proportion of

papers with LIC FA/LA. According to Figure 3, the proportion of papers with LIC FA/LA in Asia-Pacific is obviously greater than that in Africa, though the majority of papers taking place in LIC are from Africa. Figure 4 shows the distribution of region of publications within Africa. It can be seen that there is slight difference in proportion of papers with LIC FA/LA within Africa, although the proportions are all less than 50%.

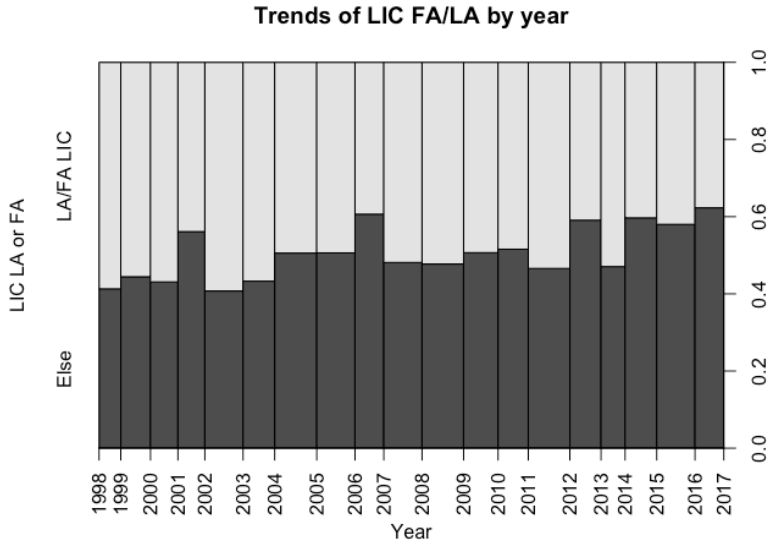

Figure 1. Distribution of publications by year

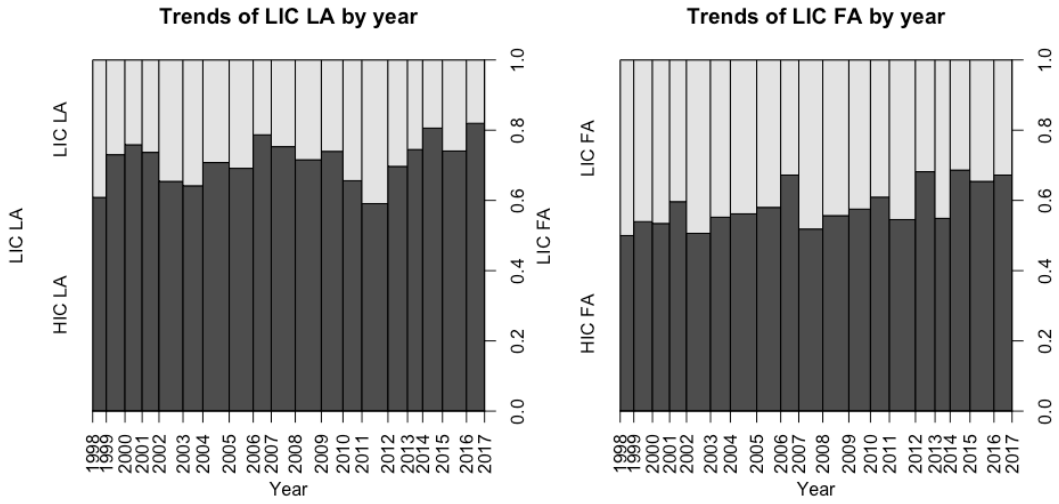

Figure 2. Comparison of the year of publications with LIC FA and LIC LA

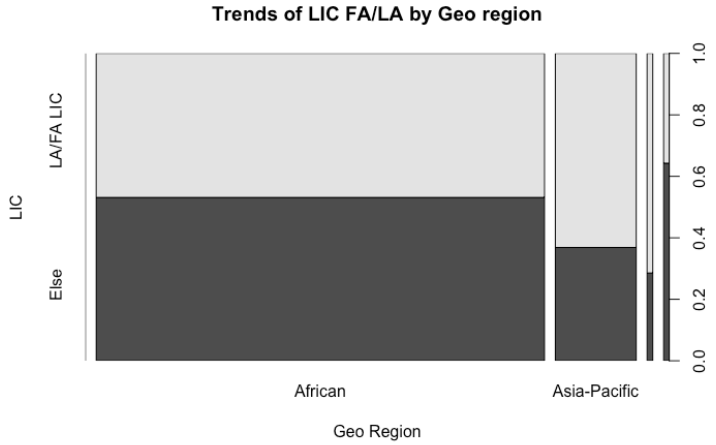

Figure 3. Distribution of publications by geography region

(African, Asia-Pacific, Eastern European, Latin American and Caribbean)

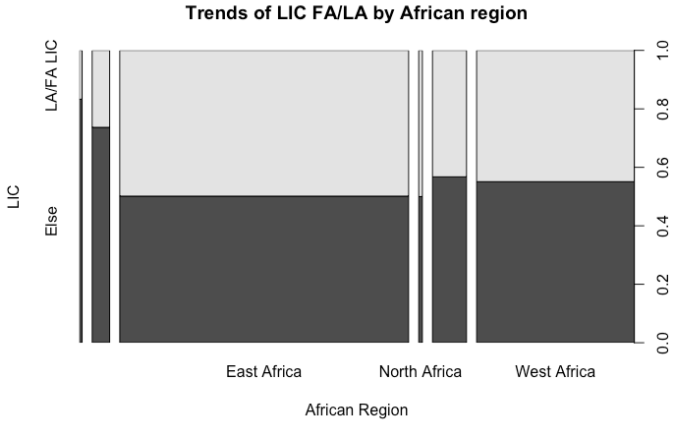

Figure 4. Distribution of publications by African areas

(Not clear, Central Africa, East Africa, North Africa, South Africa, West Africa)

Figure 2 provides the comparison of proportions of year of publications with LIC FA and LA separately. It can be seen that the trends of proportions of papers with LIC authors are similar, but the proportion of papers with LIC LA is less than the proportion of papers with LIC FA generally.

Figure 5 displays the comparison of distribution of papers by geographic region for LIC FA and LA. Still, the two plots are very similar in general. However, the proportion of papers with LIC LA is less. One thing should be noticed that the proportion of papers with LIC FA in Asia-pacific is greater than 50%.

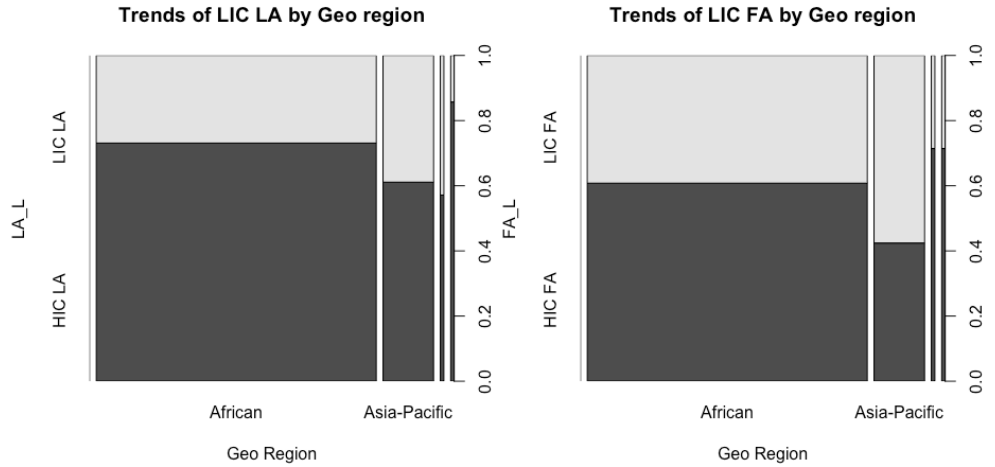

Figure 5. Comparison of the geography region of publications with LIC FA and LIC LA (African, Asia-Pacific, Eastern European, Latin American and Caribbean)

Figure 6 shows the comparison of African regions of African studies with LIC FA and that with LIC LA. It seems that, overall there is not obvious difference in proportion of papers with LIC FA among African areas, which is around 60%, whereas the proportion of papers with LIC LA in North Africa is obviously lower than that in other African areas.

Figure 7 provides the comparison of year of publication between Africa and Asia. It can be seen that the proportion of papers with LIC FA is relatively constant in Africa, though it is lower than 50% from 1998 to 2017. However, the proportion of papers with LIC FA in Asia varies greatly over the years, and is even close to zero in recent years as there are fewer Asian countries that qualify as LIC in recent years than in the past.

Figure 8 is the comparison of year of publications with LIC LA between Africa and Asia. We can observe a more variant trend for LIC LA in Asia, which is consistent with the result in Figure 7. Comparing the trend plots in Africa from Figure 7 and Figure 8, the proportion of LIC LA in Africa is lower than proportion of LIC FA in Africa in general.

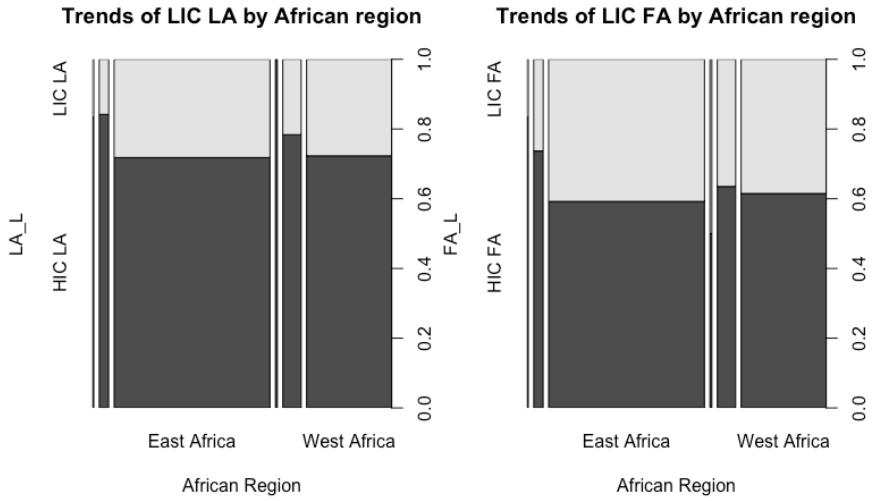

Figure 6. Comparison of the African region of African publications with LIC FA and LIC LA ((Not clear, Central Africa, East Africa, North Africa, South Africa, West Africa))

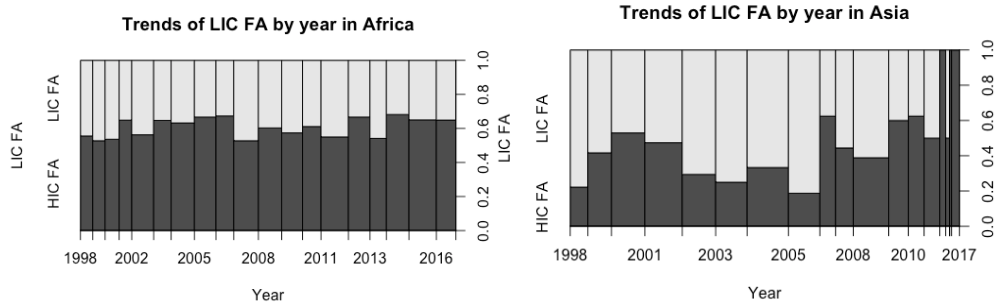

Figure 7. Comparison of year of publications with LIC FA between Africa and Asia

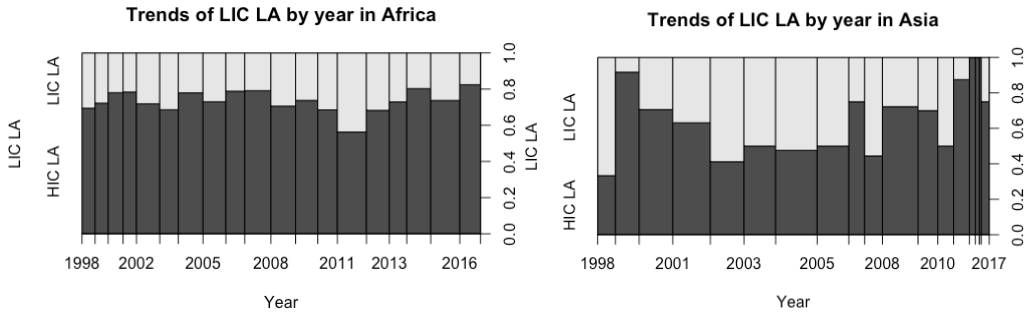

Figure 8. Comparison of year of publications with LIC LA between Africa and Asia

Results of the logistic regression analysis are shown in Table 2. We found that LIC LA/FA authorship is related to disease type, and papers about HIV (OR: 0.51 [95% CI: 0.38, 0.70]), NTD (OR: 0.49 [95%CI: 0.33, 0.72]) and malaria (OR: 0.65 [95% CI:

0.49, 0.86]) are less likely to have LIC FA/LA, compared to the Other reference group (which includes Diarrheal illness, Tuberculosis, etc.). Papers funded by United Kingdom (OR: 1.34 [95%CI: 0.94, 1.90]) tended to have greater LIC FA/LA compared to reference group, while papers funded by United States (OR: 0.60 [95%CI: 0.39, 0.92]) and international sources (OR: 0.75 [95%CI: 0.58, 0.96]) are less likely to have LIC FA/LA compared to reference group. Over time, papers in these journals tended to have less LIC LA/FA over time (OR per year: 0.97 [95% CI: 0.95, 0.99]). No association was found between different geography regions.

Similar results can also be found in the analysis of papers related to HIV. However, for papers related to Malaria, those funded by the United Kingdom (OR: 0.94 [95%CI: 0.52, 1.69]), United States (OR: 0.45 [95%CI: 0.17, 1.16]), and International sources (OR: 0.65 [0.39, 1.09]) are all less likely to have LIC LA/FA, compared to the reference group.

Table 3 has summarized the effect of disease type, funding source, and year of publication on the predictor of LIC first/last-authorship (yes/no). For researches taken place in Africa, papers related to HIV (OR: 0.49 [95%CI: 0.36, 0.68]), malaria (OR: 0.60 [95%CI: 0.44, 0.81]), and NTD (OR: 0.48 [95%CI: 0.30, 0.76]) are less likely to have LIC LA/FA, compared to the reference group. And the effect of funding source on the predictor of LIC first/last-authorship for African papers is also similar to the that of whole data set.

Discussion

Based on our analysis, we conclude that the proportion of LIC LA/FA is decreasing over time, showing that in general, the authorship equity disparities may be growing worse, and more efforts should be taken. Our results indicate that some funding agencies and some disease areas may be more advanced in terms of including LIC

LA/FA, while other areas lag behind. In particular, it appears that funding sources from the United Kingdom may be better supporting LIC research capacity in terms of authorship equity.

One of the shortcomings of our study is that we only considered three journals. The number of papers in infectious diseases from these three journals might not be representative of infectious disease research on the whole. In future studies, it may be of interest to include a more diverse set of journals to address the problem. Another limitation is that we have only examined associations of disease type, funding source, geography region, and year of publication on the probability of LIC first/last-authorship. More factors may be at play in reality. Finally, there may be dependency in the data with some papers having the same author, editors, reviewers, etc. Each of these possibilities motivated additional research in this area.

Table 2. Predictors of LIC first/last-authorship by disease type

Variables	Total (N = 1323)		HIV (N = 267)		Malaria (N = 341)		NTD (N = 140)	
	exp ($\hat{\beta}$) (95% CI)	p-value	exp ($\hat{\beta}$) (95% CI)	p-value	exp ($\hat{\beta}$) (95% CI)	p-value	exp ($\hat{\beta}$) (95% CI)	p-value
Disease								
HIV	0.51 (0.38, 0.70)	<0.01						
Malaria	0.65 (0.49, 0.86)	<0.01						
NTD	0.49 (0.33, 0.72)	<0.01						
Funding source								
United States	0.60 (0.39, 0.92)	0.02	0.30 (0.08, 0.92)	<0.05	0.45 (0.17, 1.16)	0.10	0.61 (0.08, 3.44)	0.59
United Kingdom	1.34 (0.94, 1.90)	0.10	1.80 (0.77, 4.32)	0.18	0.94 (0.52,1.69)	0.83	1.00 (0.37, 2.65)	>0.99
International	0.75 (0.58, 0.96)	0.02	0.49 (0.28, 0.87)	0.02	0.65 (0.39, 1.09)	0.10	1.03 (0.47, 2.24)	0.94
Geography Region								
Africa	1.07 (0.48, 2.35)	0.86	2.12 (0.24, 45.85)	0.53	1.16e-06	0.98	Reference*	Reference*
Asia-Pacific	1.79(0.78, 4.06)	0.16	8.14 (0.63, 225.84)	0.14	2.78e-06	0.98	1.46 (0.69, 3.06)	0.32
Year	0.97 (0.95, 0.99)	<0.01	0.96 (0.91, 1.01)	0.15	0.94 (0.90, 0.98)	<0.01	0.95 (0.88, 1.02)	0.18

Reference*: For papers in NTD, the Geo region only include Africa and Asia-Pacific, so Africa is the reference. For other circumstances, the reference is the papers with other diseases (only in Total), funding sources, Geo regions and year 0.

Table 3. Predictors of LIC first/last-authorship by Geography region

Variables	Total (N = 1323)		Africa (N = 1097)		Asia-Pacific (N = 198)	
	exp ($\hat{\beta}$) (95% CI)	p-value	exp ($\hat{\beta}$) (95% CI)	p-value	exp ($\hat{\beta}$) (95% CI)	p-value
Disease						
HIV	0.51 (0.38, 0.70)	<0.01	0.49 (0.36, 0.68)	<0.01	1.27 (0.30, 6.50)	0.75
Malaria	0.65 (0.49, 0.86)	<0.01	0.60 (0.44, 0.81)	<0.01	1.31 (0.53, 3.49)	0.60
NTD	0.49 (0.33, 0.72)	<0.01	0.48 (0.30, 0.76)	<0.01	0.54 (0.26, 1.11)	0.09
Funding source						
United States	0.60 (0.39, 0.92)	0.02	0.55 (0.34, 0.89)	0.02	0.47 (0.15, 1.47)	0.18
United Kingdom	1.34 (0.94, 1.90)	0.10	1.50 (1.04, 2.17)	0.03	0.50 (0.15, 1.67)	0.25
International	0.75 (0.58, 0.96)	0.02	0.76 (0.58, 1.01)	0.05	0.78 (0.39, 1.56)	0.48
Year	0.97 (0.95, 0.99)	<0.01	0.97 (0.95, 1.00)	0.03	0.92 (0.85, 1.00)	0.03
Geography Region	1.07 (0.48, 2.35)	0.86				
Africa	1.79 (0.78, 4.06)	0.16				
Asia-Pacific	0.97 (0.95, 0.99)	<0.01				

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