No. D008
August 21, 2024

博士論文審査結果報告
Doctoral Dissertation Defense Results

審査委員会を代表し、以下のとおり、当該学生が博士論文審査に合格したことを報告します。
On behalf of the Examination Committee, I am pleased to report that the student indicated below has successfully defended her/his dissertation.

政策研究大学院大学　　教授　　山内　慎子
Professor YAMAUCHI Chikako, National Graduate Institute for Policy Studies

プログラム名 Program	政策分析プログラム Policy Analysis Program	
学位申請者氏名（学籍番号） Name of the Candidate (ID)	Ms. CHEFKE Mihret Getaneh (PHD21304)	
論文タイトル/ Dissertation Title	Essays on the Effects of Climate Patterns and Rice Cultivation on Malaria Risk: Evidence from Sub-Saharan Africa	
(和訳/ English Translation)	（気候変動と稲作普及がマラリアのリスクに与える影響について：サハラ以南のアフリカを対象とした実証研究）	
学位名（専攻） Degree Name	博士（開発経済学） Ph.D. in Development Economics	
論文提出日 First Manuscript Submission	2024 年 7 月 3 日 July 3, 2024	
論文発表会・審査会開催日 Dissertation Defense Session and the Doctoral Dissertation Review Committee Meeting	2024 年 7 月 31 日 July 31, 2024	
論文最終版提出日 Final Manuscript Submission	2024 年 8 月 21 日 August 21, 2024	
審査委員会 Doctoral Dissertation Review Committee	主査 Main referee	山内　慎子 YAMAUCHI Chikako
	審査委員 Referee	木島　陽子 KIJIMA Yoko
	審査委員 Referee	松本　朋哉（小樽商科大学） MATSUMOTO Tomoya (Otaru University of Commerce)
	審査委員（学外） Referee (External)	中村　良太（一橋大学大学院） NAKAMURA Ryota (Hitotsubashi University)
	審査委員 （博士課程委員会） Referee (Doctoral Programs Committee)	隅藏　康一 SUMIKURA Koichi

1. 論文概要と判定理由
1. Summary of the Dissertation and the Committee's Evaluation

Despite significant advances in malaria control interventions, the disease remains significantly prevalent, particularly in sub-Saharan Africa (SSA). Every year, there are 200 to 300 million cases, resulting in one to three million deaths, with children accounting for more than 90% of the deaths in SSA. Recently, changes in climatic conditions and expansions of agricultural land, are likely to have heightened malaria transmission risk. As it gets warmer and an increase in the amount of paddy land, or water body, make the environment more mosquito-friendly, the risk of malaria is elevated.

This dissertation investigates the effects of climate patterns and rice cultivation on malaria risk and malaria avoidance behavior in sub-Saharan Africa (SSA). The results find that an increase in the share of mosquito-friendly months increases malaria incidence, especially in areas closer to water bodies and areas that are less developed in terms of the brightness of night light density. Evidence is also found that part of these effects seems explained by mosquito net usage. The candidate also reveals that the relationship between malaria risk and rice cultivation varies across countries, and countries where rice cultivation is not associated with an increased malaria risk are likely to have effective public policies for malaria control.

The candidate presented these results well. The committee members raised the questions related to the data, methodology and organization of the dissertation. For instance, given the candidate uses the information on the amount of land, which is not actual but estimated based on environmental factors, which might include rainfall and temperature, it was suggested to add detailed explanation on the estimation procedures and how the analyses on rice cultivation and climate patterns differ from each other. Also, since the candidate separates sample communities based on their relative, not absolute, intensity of rice cultivation for comparison within each country, it was suggested to include a more comprehensive explanation on the definition of this variable. Finally, a more emphasis on the equity aspect of malaria control was suggested to sharpen the focus on the dissertation and attract a broader readership. Though she misunderstood some of the questions from the referees during defense, the committee considered her performance was satisfactory for a phd degree.

2. 論文の内容（手法や結論など）と学術的貢献
2. The Dissertation's Findings, Methodologies, and its Academic Contribution

For her empirical investigation, the following three datasets were combined: (1) the data from the Demographic Health Survey, which contains malaria infection information, (2) the data from the Advancing Research on Nutrition and Agriculture (AReNA) project, which provides the land usage information, and (3) the data from the ERA-5 MONTHLY of Copernicus Climate Change Service, which includes the information on temperature and precipitation.

The community-level analysis country fixed effects and child-level analyses with community fixed

effects have been conducted. The malaria risk indicating variable at the community level is defined as weighted annual clinical cases of malaria in a community. At the child level, it is defined based on malaria test results. Climate patterns were measured by whether the pre-survey month was mosquito-friendly in terms of temperature and precipitation in a child-level analysis, and in a community-level analysis, by the annual share of mosquito-friendly months in terms of temperature and precipitation. Rice cultivation is defined as a dichotomous variable indicating one if the proportion of total farmland allocated for rice in a community is higher than the country-specific median value.

The results suggest that an increase in the share of mosquito-friendly months increases malaria incidence, especially in areas closer to water bodies and areas that are less developed in terms of the brightness of night light density. Part of this effect seems explained by mosquito net usage. That is, during mosquito-friendly months, mosquito net ownership rises, yet mosquito net usage is lower in areas closer to water bodies. Similarly, mosquito net usage increases in more luminous areas but not in less luminous areas. These results imply the importance of raising awareness on how to avoid the malaria risk using bed nets particularly for less developed communities as well as those near water bodies.

The results also suggest the relationship between malaria risk and rice cultivation varies across countries. Usually we expect that, as more farmland is allocated for rice, malaria risk increases. However, this is not the case in some countries. This dissertation finds several features that are common in those countries that manage to purge the expected positive relationship. That is, in those countries, mosquito net ownership does not depend on wealth, and children are more likely to sleep under mosquito nets in those communities with higher share of land allocated to rice. These results imply the possibility that bed nets are distributed publicly and extension programs are provided to rice producers that involve educational components informing the elevated risk of malaria around paddy land and recommending the use of bed net to mitigate the risk.

While the previous studies have mainly addressed these issues by focusing on one country or specific site in a country, this dissertation attempts to provide a general tendency by pooling as many countries as possible in SSA. Also, heterogeneity has not yet widely investigated in the effects of rice cultivation and climate patterns such as temperature and rainfall. This research sheds light on how individuals respond to the two major recent changes differently depending on whether they reside in rural areas or urban areas, whether they are rich or poor in terms of the level of wealth, and whether they live near or far away from water bodies. The current dissertation also improves on the literature on the impact of rice cultivation on malaria incidence, which has been divided into two strands: first, rice fields are considered as ideal habitats for malaria risk due to the heavy water requirement of rice cultivation; second rice production increases income, which can improve health through accessing preventative mechanisms, which creates so called the Paddies' paradox. By showing the relationship between rice cultivation and malaria risk varies across countries, and pointing out the possibility that these differences emerge due to policies influencing the equality in the distribution of bed nets and the utilization rate among rice growers, the candidate suggests yet another factor affecting the

relationship between rice cultivation and malaria risk.

3. 審査員からの主要コメントおよび修正内容

3. Comments by the Examiners and the Revisions Made

The committee members raised the questions related to the data and methodology used as well as the organization of the dissertation. For instance, given the candidate uses the information on the amount of land, which is not actual but estimated based on environmental factors, which might include rainfall and temperature, it was suggested to add detailed explanation on the estimation procedures and how the analyses on rice cultivation and climate patterns differ from each other. Also, since the candidate separates sample communities based on their relative, not absolute, intensity of rice cultivation for comparison within each country, it was suggested to include a more comprehensive explanation on the definition of this variable. Further, it was suggested that the random displacement of the DHS communities' GIS coordinates be described in the data section, and descriptive analyses of the main variables be included, such as their distribution and disparities between groups using visual presentations. Finally, a more emphasis on the equity aspect of malaria control was suggested to sharpen the focus on the dissertation and attract a broader readership.

The committee considered her dissertation draft and presentation were satisfactory for a phd degree at the defense. Thus, the candidate has addressed the comments in consultation with the supervisor, and prepared a response letter to each of the committee members. While some of the comments were useful yet not feasible due to the nature of the sample, the other comments have been addressed in the final draft of the dissertation.