

The impacts of heatwaves on antimicrobial resistance and public health: A Pitch

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Abstract

This pitching research letter (PRL) applies the systematic 2-page pitch template developed by Faff (2021, 2015) to organise a future PhD research topic regarding the effects of heatwaves on antimicrobial resistance and public health. By adhering to the template, it helps researchers to extract the succinct information required by a research proposal. The thoughtful design of the template renders it an invaluable tool for novice researchers in developing a new research plan and communicating it in an organised and structured manner.

Keywords: Pitching research, heatwaves, antimicrobial resistance, public health

JEL codes: I18, Q54, Q57

1. Introduction

The increasing episodes of heatwaves have impacted global health (Franklin *et al.*, 2023; Yong *et al.*, 2023) in various ways. Existing research shows the association between heatwaves and antimicrobial resistance (AMR), and thus its impacts to human health (Abbass *et al.*, 2022; Zeng *et al.*, 2023). Therefore, this has prompted the identification of a research topic which associates these three key elements for this research proposal. To achieve this, it required me to pinpoint the research gaps; however, the process of finding an ideal research topic and research gap can be challenging and taxing.

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Fortunately, my mentor, Kun Hing Yong, a PhD student who, truly benefited from employing the 2-page pitching template developed by Faff's (2021, 2015), introduced to me the template by recommending me to read his pitch articles, Yong (2019) and Yong and Chu (2023). The brief and concise template has offered me a valuable step to extricate requisite and salient information, and key elements to a research proposal. Its systematic structure proves to be an effective guiding tool. First, it assists researchers to highlight the worthiness of their proposal with original research ideas in the "What's new?", and "Contributions?" sections. Second, upon completion of the template, it will help researchers to gain a better understanding on the research questions, aims, data sets, research methods, and tools for conducting research. Third, the template is organised in a structured and systematic approach which facilitates researchers to present their research ideas in an organised, clear, easily understandable and concise way. The skills developed are particularly beneficial for PhD students in preparation for their confirmation presentations.

As such, this letter deliberates about my personal experience of applying the pitching research template developed by Faff (2021, 2015) to my PhD research proposal – "The Impacts of Heatwaves on Antimicrobial Resistance and Public Health". Currently, I am at the initial stage of preparing my potential PhD research proposal.

The structure of the remainder of this letter is as follows: Section 2 provides a brief review on the application of the pitch template. Section 3 describes the personal reflections upon utilising the pitch template, and finally, Section 4 concludes with a summary of my thoughts on this pitching process.

2. Brief review of the implementation of the pitch template

By adhering to the simple but clearly structured pitch research framework suggested by Faff (2021), the completed pitch research of mine with regard to heatwaves, antimicrobial resistance, and public health (Item A) is attached in Table 1. The puzzles that this research endeavour to solve are outlined in the research question section (Item B). In general, it identifies the associations between antimicrobial resistance, heatwaves, and human health. The puzzles can be identified through reading and understanding the multitude of relevant articles, as they are essential to building the knowledge for proposing and justifying a rational and worthwhile research paper. Nonetheless, for novice researchers to filter the extensive literature, narrow down the research focus areas, and subsequently find the research gaps, the task can often be overwhelming and arduous.

The "cocktail glass" approach proposed by Faff (2015) is a helpful method for novice researchers to narrow down the most relevant research scope and topic. This involves an iterative process whereby the key papers (Item C) can be identified after devoted reading of articles related to the research topic. Faff (2021, 2015) suggests that the

key papers should be influential papers that closely link with the investigated research topic, including being written by experts in the relevant research area and recently published in top-tier journals. My key papers (Li *et al.*, 2023; Magnano San Lio *et al.*, 2023; Lambraki, 2022) are stated in the pitch research template (see Table 1). The first key paper by Li *et al.* (2023), is an ecological study which investigated the relationship between antibiotic resistance and raising ambient temperature in China by using a nationwide panel data. It was published in Quartile 1 Geriatrics and Gerontology journal, The Lancet Regional Health-Western Pacific, with an impact factor of 7.1. The second key paper by Walsh *et al.* (2023), asserts the complication and multi-faceted dynamics of antimicrobial resistance (AMR), and the arising challenges to control the spread of AMR. It was published in Quartile 1 Biochemistry journal, PLoS Medicine, with an impact factor of 11.613 as of 2021. The third key paper by Lambraki *et al.* (2022), used a participatory scenario planning approach to estimate antimicrobial resistance in a changing climate of Sweden in 2050. It was published in a Quartile 1 Public Health, Environmental and Occupational Health journal, Frontiers in Public Health, with an impact factor of 5.2.

Motivations for this research are deliberated in Item D. Firstly, AMR and climate change are among the top two global public health challenges. However, the evidence of association between the two and their impacts on human health remains scanty, as it has been sparsely researched. Secondly, given an increasing trend in frequency, duration, and intensity of heatwave events due to climate change, issues of misuse or overuse of antimicrobials, and their potential health threats, it is worthwhile to explore the direct, indirect, and/or interlinked relationship of AMR, heatwaves, and human health. Thirdly, the effective strategies planning including proper and cost-effective interventions is warranted (Teo *et al.*, 2023) to address these challenges as these issues have not yet attracted sufficient attention from the Malaysian Government.

Next, the essential elements of a new research are constructed and presented through Faff's (2015, 2021) "3—2—1" design in the template. The "3" represents the core elements of any empirical research project guided by "IDioTs", namely the **I**dea, **D**ata and **T**ools. The Idea section (Item E) outlines the aims for the research. The aims of this research are to first identify the association between heatwaves and AMR. Secondly, to investigate the impacts of AMR on the risks of human morbidity and mortality via heatwaves, and thirdly, to discuss and propose relevant strategies to reduce the impacts of AMR and heatwaves on human health. The Data section (Item F) is about the setting of the research, source of data, and the methodology employed to collect data (both quantitative and qualitative). The Tools section (Item G) provides the tools or software that are utilised to input, organise, clean, run, and analyse the data for this research.

The “2” prompts questions of “What is New?” (Item H) and “So What?” (Item I), aiming to inspire novice researchers to convince the novelty outcomes of the research and challenge the researchers to justify the significance of the research. In this case, the Mickey Mouse diagram depicted in Figure 1 below is the best option, as it visually presents the novelty of the research as delineated by the intersection of the three research focus areas. The three integrated research focus areas of my research topic are heatwaves, AMR and public health. The novelty of my research is to address the knowledge gap regarding the impacts of climate change on intensifying the progress of AMR on human health, specifically from the perspectives of a middle income and tropical country, such as Malaysia. Understanding the complication of the issues will assist in future strategies planning.

The “1” is for novice researchers to highlight the significant contribution of the research (Item J), which also signifies the bottom line of the pitching research template. The contribution can be from either a theoretical or practical perspective. It can be derived from the justifications the researcher argues in Item H and Item J. With regard to this research, it will add onto the evidence of the impacts of AMR via heatwaves on human health from both developing and tropical country perspectives, while the proposed strategies via scenarios planning approach would provide more targeted, rational and clear pathways on achieving the target. This translational research can provide share solutions and new insights to countries with similar characteristics.

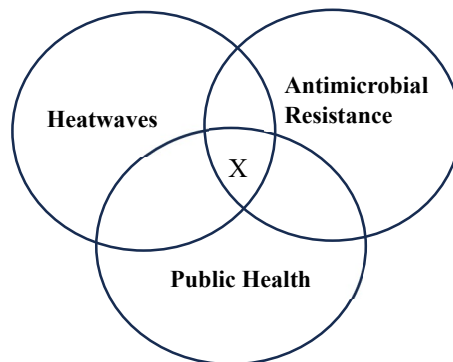


Figure 1. Mickey Mouse diagram characterizing novelty of research idea

3. Personal Reflection on the Pitching Template

In the process of preparing a PhD proposal, I personally felt stressed, as it was challenging to present my research idea with confidence in a clear, systematic and concise manner. Firstly, I was exposed to a profusion of information, repeatedly reading hundreds of articles using the “old-school method” – printed article, highlighting important points, making notes, it has undoubtedly escalated mental and

physical stress. This method was time-consuming and inefficient, while revisiting necessary information was often challenging. Secondly, I felt lost when identifying my research topics, research questions, and motivation for the research as I found it difficult to identify the research gaps.

Nonetheless, I feel extremely thankful to my mentor for introducing me to the pitch template. By reading through his pitch articles Yong (2019) and Yong and Chu (2023), I have started to apprehend strategies of retrieving valuable information and gained more intuitions in filling in the 2-page pitch template. The pitch template had facilitated me through the whole process of preparing the research proposal in an easy to visualise, understand, concise and communicable way. More importantly, the pitch template has simplified my research process, making it less stressful as well as significantly improved the efficiency and productivity of my work.

By adhering to the systematic guides through the pitch template, I was finally able to identify the research gap by using the “Mickey Mouse diagram”. Literature review indicated that despite there being plenty of research associating with climate change and AMR, the association between heatwaves, AMR and public health remains sparse in this field. This research gap has motivated me to dwell into more details for this topic. This had led to the basic research question of “What are the associations between antimicrobial resistance (AMR), heatwaves, and human health?” From the basic research question, it becomes my starting point to look for more detailed questions. After I pinpointed the three key papers, it offered me some ideas regarding quantitative and qualitative data approaches of addressing my research questions. For the “Data” and “Tools” sections, it reminded me to consider deeply about my data sets including the types of data (qualitative, quantitative, panel, time series etc.), targeted groups, country, states, periods, aged groups, etc. Indirectly, it required me to consider the programming software which will be used for the data analysis. The sections that challenged me the most were “What’s new?”, “Contributions”, and “So what?” as these sections represent the significance, value, and worthiness of a research paper.

Finally, I gained much from the structured pitch template, as it assists me to organise and construct my whole research plan confidently and systematically, supported by the succinct yet invaluable information and to better conceptualise the framework within the pitching template. The pitch template has become one of my most favourite and useful tools for communicating my research works, so much so for a novice researcher like me.

4. Conclusion

This pitching research letter summarises my personal experience of utilising a pitching research template to propose a PhD research topic regarding environment and public health during the departure to my PhD journey. The template has been a

beneficial one, as by adhering to the structure of the template, it guides novice researchers to produce a succinct research proposal, while boosting the researchers' confidence to present the essential elements of their new research proposal to the targeted audiences in a simple, concise, and easy to apprehend manner. For those reasons, I strongly agree with Faff (2021) that this methodical research planning tool benefits beyond PhD students, as the template can be used to facilitate efficient and effective communication between PhD supervisors, research collaborators or even, for mentoring purposes. Therefore, I strongly recommend this 2-page pitching template to new PhD candidates or novice researchers, as the pitching process provides a new platform to hone and improve their conceptual and analytical skills.

References

- Abbass, K., Qasim, M.Z., Song, H., Murshed, M., Mahmood, H., & Younis, I. (2022) "A review of the global climate change impacts, adaptation, and sustainable mitigation measures", *Environmental Science and Pollution Research*, vol. 29: 42539-42559. <https://doi.org/10.1007/s11356-022-19718-6>
- Faff, R. (2021) "Pitching research", *Available at SSRN*: <http://ssrn.com/abstract=2462059>.
- Faff, R. (2015) "A simple framework for pitching research", *Accounting & Finance*, vol. 55, no. 2: 311-336.
- Franklin, R.C., Mason, H.M., King, J.C., Peden, A.E., Nairn, J., Miller, L., Watt, K., & FitzGerald, G. (2023) "Heatwaves and mortality in Queensland 2010-2019: implications for a homogenous state-wide approach", *International Journal of Biometeorology*, vol. 67, no.3: 503-515. <https://doi.org/10.1007/s00484-023-02430-6>
- Lambraki, I.A., Cousins, M., Graells, T., Léger, A., Abdelrahman, S., Desbois, A.P., Gallagher, R., Staaf Larsson, B., Mattson, B., Henriksson, P., Troell, M., Søgaard Jørgensen, P., Wernli, D., Carson, C.A., Parmley, E.J., Majowicz, & S.E. (2022) "Governing Antimicrobial Resistance (AMR) in a changing climate: A participatory scenario planning approach applied to Sweden in 2050", *Frontiers in Public Health*, vol. 10: 831097. doi: 10.3389/fpubh.2022.831097.
- Li, W., Liu, C., Ho, H.C., Shi, L., Zeng, Y., Yang, X., Huang, Q., Pei, Y., Huang, C., & Yang, L. (2023) "Association between antibiotic resistance and increasing ambient temperature in China: an ecological study with nationwide panel data.", *The Lancet Regional Health-Western Pacific*, vol. 30: 100628. doi.org/10.1016/j.lanwpc.2022.100628.
- Teo, Y. N., Yong, K. H., Gautam, A.j., & Chaulagain, R. (2023) "Guarding our future: Harnessing artificial intelligence to combat antimicrobial resistance and raise public awareness", *Journal of Chitwan Medical College*, vol. 13, no.45: 1-2. doi:10.54530/jcmc.1410.
- Walsh, T.R., Gales, A.C., Laxminarayan, R., & Dodd, P.C. (2023) "Antimicrobial resistance: Addressing a global threat to humanity." *PLoS Med.*, vol. 20,

- no. 7: e1004264. doi: 10.1371/journal.pmed.1004264. PMID: 37399216; PMCID: PMC10317217.
- Yong, K.H. (2019) “The impacts of minimum wage on employers’ employment strategies and employees’ behaviour in Malaysia’s hospitality industry: A pitch”, *Accounting and Management Information Systems*, vol. 18, no. 2: 126-132.
- Yong, K.H., & Chu, C. (2023) “A Community Needs Assessment Model on heatwave-related health risks in the elderly: A pitch”, *Accounting and Management Information Systems*, vol. 22, no. 1: 173-180.
- Yong, K. H., Teo, Y. N., Azadbakht, M., Phung, H., & Chu, C. (2023) “The scorching truth: Investigating the impact of heatwaves on Selangor’s elderly hospitalisations”, *International Journal of Environmental Research and Public Health*, vol. 20, no. 10: 5910.
- Zeng, Y., Li, W., Zhao, M., Li, J., Liu, X., Shi, L., Yang, X., Xia, H., Yang, S., & Yang, L. (2023) “The association between ambient temperature and antimicrobial resistance of *Klebsiella pneumoniae* in China: a difference-in-differences analysis”, *Frontiers in Public Health*, vol.11: <https://doi.org/10.3389/fpubh.2023.1158762>

Table 1. Completed pitch template for “The Impacts of Heatwaves on Antimicrobial Resistance and Public Health: A Pitch”

Pitcher's Name	Yen Nee Ieo	For category	Health Economics	Date Completed	27 October 2023
(A) Working Title	The Impacts of Heatwaves on Antimicrobial Resistance and Public Health				
(B) Basic Research Question	What are the associations between antimicrobial resistance (AMR), heatwaves, and human health?				
(C) Key paper(s)	<p>Lambraki, I.A., Cousins, M., Graells, T., Léger, A., Abdelrahman, S., Desbois, A.P., Gallagher, R., Staaf Larsson, B., Mattson, B., Henriksson, P., Troell, M., Sogaard Jørgensen, P., Wernli, D., Carson, C.A., Parnley, E.J., Majowicz, & S.E. (2022) “Governing Antimicrobial Resistance (AMR) in a Changing Climate: A Participatory Scenario Planning Approach Applied to Sweden in 2050”, <i>Frontiers in Public Health</i>, vol. 10: 831097. doi: 10.3389/fpubh.2022.831097.</p> <p>Li, W., Liu, C., Ho, H.C., Shi, L., Zeng, Y., Yang, X., Huang, Q., Pei, Y., Huang, C., & Yang, L. (2023) “Association between antibiotic resistance and increasing ambient temperature in China: an ecological study with nationwide panel data.”, <i>The Lancet Regional Health-Western Pacific</i>, vol. 30: 100628. doi.org/10.1016/j.lanwpc.2022.100628.</p> <p>Walsh, T.R., Gales, A.C., Laxminarayan, R., Dodd, P.C. (2023) “Antimicrobial Resistance: Addressing a Global Threat to Humanity.” <i>PLoS Med.</i>, vol. 20, no. 7: e1004264. doi: 10.1371/journal.pmed.1004264. PMID: 37399216; PMCID: PMC10317217.</p>				
(D) Motivation/Puzzle	Antimicrobial resistance (AMR) and climate change are among the top two global public health challenges. However, the evidence of association between the two and their impacts on human health remains scanty, as it has been sparsely researched. Given an increasing trend in frequency, duration, and intensity of heatwave events as a result of climate change, issues of misuse or overuse of antimicrobials, and their potential health threats, it is worthwhile to explore the direct, indirect, and/or interlinked relationship of them on human health. In addition, proper and effective strategies planning are warranted to address these challenges.				
THREE	Three core aspects of any empirical research project i.e. the “ DIoTs ” guide				
(E) Idea?	<p>This paper aims to investigate:</p> <ol style="list-style-type: none"> i. Association between heatwaves and AMR. ii. Hypothesis 1: Heatwaves is anticipated to positively associate with AMR. The impacts of AMR on the risks of human morbidity and mortality via heatwaves. iii. Hypothesis 2.1: Risks of human morbidity of AMR are anticipated to increase with heatwaves. Hypothesis 2.2: Risks of human mortality of AMR are anticipated to increase with heatwaves. Strategies to reduce the impacts of AMR and heatwaves on human health 				

Pitcher's Name	Yen Nee Teo	FoR category	Health Economics	Date Completed	27 October 2023
(F) Data?	Setting: Malaysia a. Quantitative data: Panel data from January 2010 to 31 December 2023. Sample: Patients suffered from pneumonia disease, age cohort: less than 5 years old, 5 to 60 years old, and more than 60 years old. Data source: Health Informatics Centre, Ministry of Health, Malaysia; Malaysian Meteorological Department, Ministry of Natural Resources, Environment & Climate Change, Malaysia. Potential missing data issues. b. Qualitative data: Method: Survey, Focus Group Meetings. Target groups: Medical practitioners, Relevant Policy Makers, Patients (and parents for patients less than 5 years old)				
(G) Tools?	Quantitative analysis: applied via panel data & regression model approach. Regression using R programming software Qualitative analysis: applied Community Need Assessment approach. Regression using Nvivo software				
TWO	Two key questions				
(H) What's New?	This paper will be the first paper to investigate the indirect impacts of AMR on morbidity and mortality of people in Malaysia from heatwaves. More importantly, the author plans to propose strategies to address these challenges via scenarios planning which will assist in achieving the target effectively.				
(I) So What?	Literatures have suggested that the growth of AMR is likely to be inter-related with climate change. Given the current trend of climate change, further concerns have been raised about the impacts of climate change on intensifying the progress of AMR on human health. Nonetheless, evidence for the association between the two aspects remain sparsely researched despite recognising the importance of them for future policy planning. Therefore, considering the prominent impacts of these issues on human health, this is promising enough to warrant further research.				
ONE	One bottom line				
(J) Contribution?	One of the contributions of this research includes additional evidence of the impacts of AMR via heatwaves on human health from both developing and tropical country perspectives. Proposed strategies via scenarios planning approach would provide more targeted, rational and clear pathways on achieving the target. Useful and accurate information is pertinent as it would assist policy makers on designing more effective strategies for their planning. This translational research can provide shared solutions and new insights to countries with similar characteristics.				
(K) Other Considerations	Target journals: i. The International Journal of Climate Change: Impacts and Responses ii. The Lancet iii. Journal of Earth Science and Climatic Change				