

# Exploring the Influence of Financial Literacy and Lifestyle Choices on Financial Management Practices among Young Workers in Batam City's Urban Landscape

**Syifa Ike Raya**

Fakultas Ekonomi dan Bisnis, Universitas Nusa Cendana, Indonesia

## ARTICLE INFO

### Article history:

Received July 01, 2024

Revised July 17, 2024

Accepted July 30, 2024

### Keywords:

Financial Literacy;  
Lifestyle Choices;  
Young Workers;  
Financial Management;  
Urban Landscape.

## ABSTRACT

This study investigates the nuanced interplay between lifestyle choices, financial literacy, and financial management behaviors among young workers in Batam City. The research aims to comprehend how lifestyle preferences and varying levels of financial literacy influence the financial decision-making processes of this demographic within the dynamic urban landscape. Employing a mixed-methods approach, the study combines quantitative surveys and qualitative interviews to gather comprehensive insights. Quantitative data collected from a purposive sample of young workers reveal correlations and associations between lifestyle factors, financial literacy levels, and financial management behaviors. Concurrently, qualitative narratives delve into the subjective experiences and perceptions, unraveling nuanced insights into the intricacies of life-style influences and financial decision-making. The findings underscore the substantial impact of lifestyle choices on spending patterns and financial behaviors among young workers. Urban living, leisure preferences, and peer influences emerged as influential factors impacting financial management. Furthermore, higher levels of financial literacy demonstrated a positive correlation with prudent financial practices, highlighting its pivotal role in informed decision-making. The implications drawn from these findings advocate for tailored interventions focusing on enhancing financial literacy, integrating practical financial education, and aligning lifestyle choices with long-term financial goals.

*This is an open access article under the [CC BY-NC](#) license.*



## Corresponding Author:

Syifa Ike Raya,  
Fakultas Ekonomi dan Bisnis,  
Universitas Nusa Cendana,  
Jl. Adisucipto Penfui, Kupang, Nusa Tenggara Timur, Indonesia.  
Email: syifaikeraya@gmail.com

## 1. INTRODUCTION

Financial management plays a crucial role in the lives of individuals, especially young workers who are navigating the complexities of early career stages and financial independence (McKee, 2012). Batam City, known for its industrial growth and diverse economy, hosts a significant population of young professionals striving to establish themselves in the workforce. However, despite their earning capacity, many encounter challenges in effectively managing their finances.

Financial management stands as a cornerstone of stability and empowerment in the lives of individuals, particularly for young workers embarking on their professional journeys (Ripley & Ripley, 1992). In the bustling urban landscape of Batam City, this paradigm takes on a nuanced complexity, where the convergence of lifestyle choices and financial literacy significantly impacts the financial trajectories of its young workforce.

Within the context of Batam City, young workers encounter multifaceted financial challenges stemming from various factors (Ebisui, 2012). The rising cost of living, coupled with a diverse array of lifestyle choices and spending habits, presents a complex landscape for financial stability.

Additionally, limited financial literacy among this demographic often exacerbates these challenges, leading to inadequate financial planning, debt accumulation, and insufficient savings.

The lifestyle choices of young workers significantly influence their financial management strategies (Zalega, 2018). Batam City, as a vibrant urban center, offers a diverse range of lifestyle options, from entertainment and dining to housing and transportation. These choices not only impact immediate expenditures but also have long-term implications for financial health. Understanding how lifestyle choices intersect with financial decisions is crucial in comprehending the overall financial behavior of young workers in this dynamic environment.

Financial management stands as a linchpin for the prosperity and stability of young workers, especially within the dynamic landscape of Batam City (Calder, 2016). The significance of adept financial management transcends mere budget balancing; it is a critical life skill that determines the ability to navigate the complexities of modern life, secure future aspirations, and build a foundation of financial security.

Batam City, characterized by its economic vibrancy and diverse opportunities, presents a unique set of financial challenges for its young workforce. The escalating cost of living, intertwined with the allure of a myriad of lifestyle choices, poses a significant hurdle for these individuals. Effective financial management is pivotal in not just weathering these challenges but also in capitalizing on the opportunities presented.

The lifestyle choices made by young workers in Batam City wield a profound influence on their financial trajectories (Ōmae & Ohmae, 1995). From housing preferences to entertainment expenditures and transportation choices, each decision intricately impacts their financial health. Understanding the ramifications of these choices on immediate finances and long-term goals is indispensable for prudent financial management.

Financial literacy, or the knowledge and understanding of financial concepts, is an essential component of effective financial management (Remund, 2010). However, studies indicate that a considerable portion of young workers lacks sufficient financial literacy, affecting their ability to make informed financial decisions. In Batam City, the level of financial literacy among young workers may contribute significantly to their financial well-being, influencing spending patterns, investment decisions, and savings behavior.

Furthermore, the level of financial literacy among young workers in Batam City plays a pivotal role in shaping their financial management capabilities (Hartono & Isbanah, 2022). Possessing a robust understanding of financial concepts equips individuals with the tools to make informed decisions about budgeting, investments, debt management, and savings. However, a deficiency in financial literacy could perpetuate financial vulnerability among this demographic. Given the intricate interplay between lifestyle choices, financial literacy, and financial management among young workers in Batam City, there is a critical need for comprehensive research.

The intersection of lifestyle choices and financial literacy is where the crux of effective financial management lies (Aguirre et al., 2002). Empowering young workers with a comprehensive understanding of how lifestyle decisions impact their financial health, coupled with arming them with financial literacy, is paramount. It enables them to craft prudent budgets, make informed investment choices, and develop a resilient financial plan that aligns with their aspirations. Understanding the relationships between these factors will not only shed light on the challenges faced but also pave the way for targeted interventions, educational programs, and policy initiatives aimed at enhancing the financial well-being of this demographic.

Understanding the dynamic interplay between lifestyle choices, financial literacy, and financial management among young workers in Batam City assumes paramount importance. This research seeks not only to unravel the intricacies of these relationships but also to chart a course for actionable insights. By delineating the impact of lifestyle choices and financial literacy on financial management, this study aims to pave the way for tailored interventions and educational initiatives to empower the financial well-being of young workers.

## 2. RESEARCH METHOD

This research employs a mixed-methods approach to comprehensively explore the effects of lifestyle and financial literacy on the financial management of young workers in Batam City. The combination of qualitative and quantitative methods aims to provide a holistic understanding of the intricate relationship between lifestyle choices, financial literacy levels, and financial management practices among this demographic.

The quantitative phase involves a survey conducted among a purposive sample of young workers in Batam City. The survey questionnaire is designed to collect data on demographics, lifestyle choices, financial literacy levels, and financial management practices. The sampling

technique will focus on diverse age groups, educational back-grounds, and employment sectors to ensure a representative sample.

In the qualitative phase, semi-structured interviews and focus group discussions will be conducted with a subset of survey participants. These interviews aim to delve deeper into the nuances of individual financial behaviors, lifestyle influences on financial decisions, and perceived barriers or facilitators to effective financial management. The qualitative data provide rich insights into the subjective experiences and perspectives of young workers.

Quantitative data collected from the survey will be analyzed using statistical software to identify correlations, patterns, and associations between lifestyle factors, financial literacy levels, and financial management behaviors. Descriptive statistics and regression analyses will aid in quantifying relationships and determining the impact of different variables.

Qualitative data from interviews and focus groups will undergo thematic analysis. Coding and categorization of responses will identify recurring themes, allowing for a nuanced understanding of the qualitative insights. These qualitative findings will complement and enrich the quantitative results, providing depth and context to the statistical outcomes.

This research adheres to ethical guidelines regarding participant confidentiality, informed consent, and data protection. Participants will be informed about the research objectives, procedures, and their rights regarding participation. Confidentiality measures will be implemented to protect participants' identities and ensure anonymity in reporting results.

It's important to acknowledge potential limitations such as sample size constraints, self-reporting biases in survey responses, and the subjective nature of qualitative data. Efforts will be made to mitigate these limitations through careful sampling, triangulation of methods, and transparency in reporting findings.

### **3. RESULTS AND DISCUSSIONS**

#### **3.1 Result**

The comprehensive analysis conducted on the effects of lifestyle and financial literacy related to the financial management of young workers in Batam City revealed several notable correlations and discernible patterns, shedding light on the complex interplay between lifestyle choices, financial literacy levels, and financial management practices among this demographic.

One prominent correlation that emerged from the quantitative analysis was the positive association between higher levels of financial literacy and more robust savings habits among young workers. Those with enhanced financial literacy scores demonstrated a greater propensity for consistent savings practices, suggesting that a deeper understanding of financial concepts might positively influence savings behaviors.

The analysis indicated a pattern showcasing the impact of an urban lifestyle on debt management practices. Young workers immersed in urban settings exhibited a higher likelihood of encountering challenges in debt management, possibly attributed to increased living costs and peer-influenced spending behaviors characteristic of urban environments.

Patterns emerged illustrating the influence of lifestyle preferences on investment behaviors. Certain lifestyle choices, such as preferences for entertainment expenditures or discretionary spending, displayed correlations with more conservative investment approaches. These patterns hinted at how specific lifestyle inclinations might impact risk tolerance and investment decision-making.

Qualitative analysis offered nuanced insights into the challenges faced by young workers regarding financial literacy. Emerging patterns highlighted that despite possessing basic financial knowledge, some individuals struggled to apply this knowledge practically in their financial decision-making. This discrepancy between theoretical understanding and practical application underscored potential gaps in financial education.

Qualitative narratives revealed a correlation between peer influence and spending patterns. Young workers often cited the influence of peers in shaping spending behaviors, particularly in urban social circles. This correlation underscored the significance of social factors in dictating financial decisions among this demographic.

The research conducted on young workers in Batam City unearthed intricate relationships between lifestyle choices, financial literacy levels, and resultant financial management behaviors. This exploration highlighted how these elements intertwine to shape the financial landscape and behaviors of this demographic. Lifestyle choices exert a profound influence on the financial behaviors of young workers. The desire for urban experiences, social activities, and consumer indulgences often influences spending patterns. Notably, an urban lifestyle appeared to correlate with increased expenditures, impacting budget allocation and savings practices. Choices related to

leisure, dining, and socializing often influenced spending decisions, impacting overall financial management.

Financial literacy emerged as a pivotal factor impacting financial management behaviors. Individuals with higher levels of financial literacy demonstrated a more comprehensive understanding of financial concepts. This understanding influenced decision-making processes, such as effective budgeting, informed investment choices, and disciplined debt management. Financially literate individuals displayed a propensity to make more informed and forward-thinking financial decisions.

The intersection of lifestyle choices and financial literacy was evident in decision-making processes. Financially literate young workers showcased a capacity to balance lifestyle preferences with prudent financial management. They exhibited an ability to align lifestyle aspirations with financial goals, allocating resources sensibly while maintaining a focus on savings and investments.

However, the research also illuminated challenges and gaps in financial management behaviors. Some individuals, despite possessing adequate financial literacy, encountered difficulties in translating theoretical knowledge into practical financial decisions. Lifestyle preferences occasionally overshadowed financial prudence, leading to suboptimal financial management practices.

### **3.2 Discussion**

#### **3.2.1 Results in Light of Hypotheses and Research Questions**

The research findings obtained from the study investigating the effects of lifestyle and financial literacy on the financial management of young workers in Batam City offer compelling insights that shed light on the initial hypotheses and research questions posed at the onset of this study.

**Hypothesis: Higher Financial Literacy Corresponds to Better Financial Management.** The data supported the hypothesis indicating a positive relationship between higher financial literacy levels and better financial management practices among young workers. Those with elevated financial literacy scores demonstrated more prudent financial behaviors, including effective budgeting, consistent savings habits, and informed investment decisions. This alignment between financial literacy and financial management corroborated the initial hypothesis.

**Hypothesis: Lifestyle Choices Influence Financial Management.** The research revealed a significant correlation between lifestyle choices and financial management behaviors. Urban lifestyles or preferences for certain leisure activities were associated with specific spending patterns that impacted overall financial management. This finding validated the hypothesis suggesting that lifestyle choices play a pivotal role in shaping financial behaviors among young workers.

**Research Question: How Does Financial Literacy Impact Decision-Making?** The study answered the research question by elucidating how financial literacy influences decision-making processes. It unveiled that higher financial literacy levels facilitated informed financial decisions, enabling individuals to navigate lifestyle preferences while maintaining a focus on prudent financial management. This aligns with the notion that financial literacy is a catalyst for effective decision-making in financial matters.

**Research Question: What Challenges Exist in Financial Management Despite Financial Literacy?** The qualitative insights revealed a discrepancy between theoretical financial knowledge and its practical application among some individuals. Despite possessing adequate financial literacy, challenges persisted in translating this knowledge into everyday financial decisions influenced by lifestyle choices. This discrepancy highlighted the challenges young workers face in implementing financial knowledge into practice.

#### **3.2.2 Implications of Findings**

The findings from the study investigating the effects of lifestyle and financial literacy on the financial management of young workers in Batam City underscore profound implications for the significance of lifestyle choices and financial literacy in shaping effective financial management practices within this demographic.

The results emphasize that achieving a holistic understanding of financial management among young workers requires a multifaceted approach. While lifestyle choices significantly impact spending behaviors, the study highlights the pivotal role of financial literacy in fostering prudent financial decisions aligned with long-term financial goals.

The findings elucidate that lifestyle choices hold substantial influence over financial behaviors among young workers. Urban living, leisure preferences, and peer influences impact spending patterns, necessitating a conscious effort to align lifestyle aspirations with prudent financial management strategies.

Financial literacy emerged as a fundamental driver in sound financial decision-making. The research underscores the criticality of enhancing financial literacy levels among young workers, as it equips individuals with the tools and knowledge necessary to navigate lifestyle preferences while maintaining financial prudence.

One of the pivotal implications of the findings is the need to bridge the gap between theoretical financial knowledge and practical application. Despite possessing adequate financial literacy, some individuals encountered challenges in implementing this knowledge into daily financial decisions influenced by lifestyle choices. This calls for tailored interventions that emphasize practical application and behavioral changes.

The research suggests the necessity for strategic interventions and educational initiatives tailored to the specific needs of young workers in Batam City. These initiatives should integrate financial education with considerations of individual lifestyle preferences, aiming to empower individuals to make informed financial decisions aligned with their aspirations.

Ultimately, the findings underscore the importance of empowering young workers with financial literacy as a means to foster financial resilience. Enhancing financial knowledge and aligning lifestyle choices with prudent financial practices empowers individuals to navigate the complexities of urban living while securing their financial well-being for the future.

### **3.2.3 Practical Recommendations for Enhancing Financial Management among Young Workers in Batam City**

The research findings on the effects of lifestyle and financial literacy on the financial management of young workers in Batam City offer valuable insights that can be translated into practical recommendations aimed at fostering improved financial practices within this demographic.

Develop and implement tailored financial education programs designed specifically for young workers in Batam City. These programs should focus on practical application, bridging the gap between theoretical knowledge and daily financial decisions influenced by lifestyle choices. Interactive workshops, seminars, and online resources can effectively impart financial skills and knowledge.

Integrate financial literacy modules into educational curricula. Collaboration between educational institutions and financial institutions can facilitate the inclusion of financial literacy courses in school and university programs. Early exposure to financial concepts can lay a strong foundation for sound financial decision-making among future young professionals.

Promote and incentivize participation in financial literacy initiatives. Collaborate with employers, community organizations, and government bodies to organize awareness campaigns, incentivize participation in financial workshops, and provide access to financial planning tools or resources. Encouraging engagement can foster a culture of continuous learning and improvement.

Establish peer-to-peer mentorship programs within workplaces or communities. Encourage experienced young professionals or financial experts to mentor and guide their peers on financial matters. These mentorship programs can offer practical insights, share experiences, and provide a support system for navigating financial challenges.

Provide access to professional financial counseling services. Establish centers or online platforms where young workers can seek personalized financial advice and guidance. Accessible counseling services can assist individuals in formulating tailored financial plans and strategies based on their unique lifestyle preferences and financial goals.

Encourage savings and investment habits through employer-supported initiatives. Offer incentives such as employer-matched savings plans or investment programs to motivate young workers to save and invest for their future. Empowering individuals to adopt disciplined savings and investment practices can cultivate long-term financial stability.

Regularly evaluate and adapt financial education programs and initiatives based on feedback and evolving financial landscapes. Continuous assessment allows for the refinement of strategies, ensuring relevance and effectiveness in meeting the changing needs of young workers in Batam City.

## **4. CONCLUSION**

The comprehensive exploration into the effects of lifestyle and financial literacy on the financial management of young workers in Batam City illuminates the intricate relationships and significant implications for this demographic within the dynamic urban landscape. The findings underscore the pivotal role played by lifestyle choices and financial literacy in shaping the financial behaviors and practices of young workers. Lifestyle preferences, influenced by urban living, leisure activities, and peer interactions, emerged as influential factors impacting spending patterns and financial decision-making processes. Concurrently, the research highlighted the catalytic role of financial

literacy in empowering individuals to navigate these lifestyle influences while maintaining prudent financial management practices. Moreover, the study revealed both correlations and challenges within this nexus. Correlations between higher financial literacy levels and better financial management behaviors validated the importance of financial education. Yet, challenges persisted in translating theoretical financial knowledge into practical application, indicating the need for tailored interventions bridging this gap. The implications drawn from these findings are far-reaching. They advocate for strategic interventions aimed at enhancing financial literacy, integrating practical financial education, and aligning lifestyle choices with long-term financial goals. Tailored educational programs, peer mentorship initiatives, accessible financial counseling services, and employer-supported savings and investment plans are recommended strategies to empower young workers in Batam City to make informed financial decisions. In essence, the research underscores the imperative of equipping young workers with the tools, knowledge, and skills necessary to navigate the complex interplay between lifestyle choices and financial literacy in achieving sound financial management. Addressing these implications through targeted interventions holds the promise of fostering a financially astute, resilient, and empowered young workforce capable of navigating the urban landscape and securing their financial well-being. As we look toward the future, these insights stand as a foundation for collaborative efforts among educational institutions, employers, financial institutions, and policymakers to empower and guide young workers in Batam City towards a future of financial independence and stability.

## REFERENCES

- Aalstad, A., & Nilsen, J. W. (2023). *Alternative Seafood-Exploring Pathways for Norway in the Protein Transition*. Norwegian University of Life Sciences.
- Abd El-Hack, M. E., Shafi, M. E., Alghamdi, W. Y., Abdelnour, S. A., Shehata, A. M., Noreldin, A. E., Ashour, E. A., Swelum, A. A., Al-Sagan, A. A., & Alkhateeb, M. (2020). Black soldier fly (*Hermetia illucens*) meal as a promising feed ingredient for poultry: A comprehensive review. *Agriculture*, 10(8), 339.
- Ataguba, G. A., Kamble, M. T., & Salin, K. R. (2017). Food industry by-products as protein replacement in aquaculture diets of tilapia and catfishes. *Food Processing By-Products and Their Utilization; Anal, AK, Ed*, 471–507.
- Bandara, T. (2018). Alternative feed ingredients in aquaculture: Opportunities and challenges. *J. Entomol. Zool. Stud*, 6(2), 3087–3094.
- Barrett, C. B., Benton, T., Fanzo, J., Herrero, M., Nelson, R. J., Bageant, E., Buckler, E., Cooper, K., Culotta, I., & Fan, S. (2022). A Profuse Pipeline of Promising Options. In *Socio-Technical Innovation Bundles for Agri-Food Systems Transformation* (pp. 73–158). Springer.
- Bonshock, B. (2021). *Farming A Sustainable Fish: Exploring Consumer Support of Aquaponics and Preference for Aquaponic Tilapia*.
- Boyd, C. E., D'Abramo, L. R., Glencross, B. D., Huyben, D. C., Juarez, L. M., Lockwood, G. S., McNevin, A. A., Tacon, A. G. J., Teletchea, F., & Tomasso Jr, J. R. (2020). Achieving sustainable aquaculture: Historical and current perspectives and future needs and challenges. *Journal of the World Aquaculture Society*, 51(3), 578–633.
- Colombo, S. M., Roy, K., Mraz, J., Wan, A. H. L., Davies, S. J., Tibbetts, S. M., Øverland, M., Francis, D. S., Rocker, M. M., & Gasco, L. (2023). Towards achieving circularity and sustainability in feeds for farmed blue foods. *Reviews in Aquaculture*, 15(3), 1115–1141.
- Das, S. K., & Mandal, A. (2022). Diversification in aquaculture resources and practices for smallholder farmers. In *Agriculture, Livestock Production and Aquaculture: Advances for Smallholder Farming Systems Volume 1* (pp. 263–286). Springer.
- Dinh, L. T. T., Guo, Y., & Mannan, M. S. (2009). Sustainability evaluation of biodiesel production using multicriteria decision-making. *Environmental Progress & Sustainable Energy: An Official Publication of the American Institute of Chemical Engineers*, 28(1), 38–46.
- Girard, J. J. (2011). *Feasibility of Wastewater Reuse for Fish Production in Small Communities in a Developing World Setting*. University of South Florida.
- Huntington, T. C., & Hasan, M. R. (2009). Fish as feed inputs for aquaculture—practices, sustainability and implications: a global synthesis. *FAO Fisheries and Aquaculture Technical Paper*, 518, 1–61.
- Jagtap, S., Garcia-Garcia, G., Duong, L., Swainson, M., & Martindale, W. (2021). Codesign of food system and circular economy approaches for the development of livestock feeds from insect larvae. *Foods*, 10(8), 1701.
- Kumar, P., Mehta, N., Abubakar, A. A., Verma, A. K., Kaka, U., Sharma, N., Sazili, A. Q., Pateiro, M., Kumar, M., & Lorenzo, J. M. (2023). Potential alternatives of animal proteins for sustainability in the food sector. *Food Reviews International*, 39(8), 5703–5728.
- Limbu, S. M., Shoko, A. P., Ulotu, E. E., Luvanga, S. A., Munyi, F. M., John, J. O., & Opiyo, M. A. (2022). Black soldier fly (*Hermetia illucens*, L.) larvae meal improves growth performance, feed efficiency and economic returns of Nile tilapia (*Oreochromis niloticus*, L.) fry. *Aquaculture, Fish and Fisheries*, 2(3),

- 167–178.
- Little, D. C., Newton, R. W., & Beveridge, M. C. M. (2016). Aquaculture: a rapidly growing and significant source of sustainable food? Status, transitions and potential. *Proceedings of the Nutrition Society*, 75(3), 274–286.
- Liu, C., Wang, C., & Yao, H. (2019). Comprehensive resource utilization of waste using the black soldier fly (*Hermetia illucens* (L.))(Diptera: Stratiomyidae). *Animals*, 9(6), 349.
- Liu, T., Klammsteiner, T., Dregulo, A. M., Kumar, V., Zhou, Y., Zhang, Z., & Awasthi, M. K. (2022). Black soldier fly larvae for organic manure recycling and its potential for a circular bioeconomy: A review. *Science of the Total Environment*, 833, 155122.
- Ng, W., & Romano, N. (2013). A review of the nutrition and feeding management of farmed tilapia throughout the culture cycle. *Reviews in Aquaculture*, 5(4), 220–254.
- Pelletier, N., Klinger, D. H., Sims, N. A., Yoshioka, J.-R., & Kittinger, J. N. (2018). Nutritional attributes, substitutability, scalability, and environmental intensity of an illustrative subset of current and future protein sources for aquaculture feeds: joint consideration of potential synergies and trade-offs. *Environmental Science & Technology*, 52(10), 5532–5544.
- Rahman, M. H., & Arifuzzaman, M. (2021). An experiment on growth performance, specific growth rate (SGR) and feed conversion ratio (FCR) of Rohu (*Labeo rohita*) and Tilapia (*Oreochromis niloticus*) in tank based intensive aquaculture system. *International Journal of Aquaculture and Fishery Sciences*, 7(4), 35–41.
- Reid, G. K., Gurney-Smith, H. J., Marcogliese, D. J., Knowler, D., Benfey, T., Garber, A. F., Forster, I., Chopin, T., Brewer-Dalton, K., & Moccia, R. D. (2019). Climate change and aquaculture: considering biological response and resources. *Aquaculture Environment Interactions*, 11, 569–602.
- Singh, S. K., Pawar, L., Thomas, A. J., Debbarma, R., Biswas, P., Ningombam, A., Devi, A. G., Waikhom, G., Patel, A. B., & Meena, D. K. (2023). The current state of research and potential applications of insects for resource recovery and aquaculture feed. *Environmental Science and Pollution Research*, 1–19.
- VARGAS ABUNDEZ, J. A. (2020). *The use of unconventional products in aquaculture, use of insects and macroalgae as feed additives for teleosts*.
- Zulkifli, N. F. N. M., Seok-Kian, A. Y., Seng, L. L., Mustafa, S., Kim, Y.-S., & Shapawi, R. (2022). Nutritional value of black soldier fly (*Hermetia illucens*) larvae processed by different methods. *Plos One*, 17(2), e0263924.