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The costs of locally acquired malaria cases in the United States in 2023: A modeling study

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Abstract

Background

Globally, malaria remains a major public health challenge, resulting in millions of cases every year, especially in vulnerable populations such as children and pregnant women in sub-Saharan Africa. In the United States, while most of the approximately 2,000 malaria cases treated annually are from international travel, on the rare occasions when malaria is transmitted locally, a broader response than just medical treatment alone is required.

Methods

We examine the costs of ten locally acquired malaria cases using results from the literature, key informant interviews, and various modeling assumptions to estimate direct medical treatment costs, client costs, costs of the public health response, and health systems costs. Given that several variables in the analysis have some level of uncertainty, we conduct a Monte Carlo simulation analysis in Excel to simultaneously vary these uncertain inputs for 10,000 simulations and report the median estimated costs as well as the interquartile range.

Results

We find that the estimated costs of responding to these cases in 2023 was $2.4 million, or $242,960 per case. Interestingly, while there were seven cases in Florida versus one case in Arkansas, the costs of the state and local public health response were 21 times greater in Florida than in Arkansas, rather than simply seven times greater.

Conclusions

These estimates describe a conservative estimate in a year when containment succeeded. As such continued investments to prevent the spread of malaria both domestically and abroad are crucial to improving health and economic wellbeing.

Background

Globally, malaria remains a major public health challenge, especially in tropical and developing regions. Caused by parasites transmitted through infected mosquitoes, malaria leads to fever, chills, weakness, and sometimes death. Millions of cases occur every year, with children and pregnant women being the most vulnerable, particularly in sub-Saharan Africa. Poverty, poor sanitation, climate conditions, and limited access to healthcare contribute to the spread of malaria in developing countries. Efforts to control malaria include the use of insecticide-treated bed nets, indoor spraying, antimalarial medicines,

and public health education. In 2024, $3.9 billion was spent on malaria control and elimination across 90 malaria endemic countries, to which the United States (US) contributed $1.4 billion [1].

In the United States, while most of the approximately 2,000 malaria cases treated annually are related to international travel [2], malaria has been transmitted locally, including ten cases in 2023, which were the first cases detected in 20 years [3–5]. While cases among travelers typically necessitate only medical treatment, locally acquired, or autochthonous, malaria cases require a broader public health response.

The total costs of autochthonous malaria cases comprise medical treatment costs (laboratory testing, physician consultations, hospitalization, antimalarial medications and intensive care treatment for severe cases); client costs (out-of-pocket spending on co-payments, travel and other expenses, and opportunity costs, or lost productivity, for both patients and their families); a public health response (disease surveillance, mosquito control programs, contact tracing, and public information efforts to prevent further transmission); and health systems costs (blood bank testing, physician training, supply chain factors) [6].

To better understand the potential financial implications of increased local malaria transmission, we utilize results from the literature, key informant interviews, and modeling assumptions to estimate the costs associated with the ten autochthonous malaria cases in the United States in 2023.

Methods

We calculate the costs of the ten autochthonous malaria cases in the United States in 2023 by utilizing data culled from the literature and key informant interviews and then combining these data with various modelling assumptions. The data sources and assumptions underlying each of the cost components and the sensitivity analysis used are described in detail below.

Direct medical treatment costs

To estimate direct medical treatment costs, we utilize results from the literature that employ Merative MarketScan databases which stratify the direct costs of treating malaria nationally by: whether the patient is hospitalized; payer (private insurance vs. Medicaid); severity (for private insurance only); and whether the malaria diagnosis was the primary or non-primary diagnosis [7]. The databases record reported payments, i.e., actual reimbursement for provided services, and include inpatient and outpatient medical services as well as outpatient prescription drug costs, along with the associated lengths of stay for hospitalizations. The total costs are further disaggregated into insurance payments vs. out-of-pocket payments, and 95% confidence intervals are also provided. Costs were adjusted to 2023 US dollars using the US medical consumer price index [8].

Table 1 displays the characteristics associated with the 10 autochthonous malaria cases based on reports [3–5]. We assume all cases had private insurance except the three cases in Florida that were reported as “experiencing homelessness,” which for the purposes of this analysis are assumed to have

Medicaid coverage. All cases except one were hospitalized; of those hospitalized, only one severe case was reported.

Table 1
Characteristics of Locally Acquired Malaria Cases in the United States in 2023

Case Number	State	Hospitalized (Yes/No)	Payer	Severity (Severe/ Not severe)	Diagnosis (Primary/ Non-primary)
1	Florida	Yes	Private	Not severe	Non-primary
2	Florida	Yes	Private	Not severe	Primary
3	Florida	Yes	Private	Not severe	Primary
4	Florida	Yes	Medicaid	Not severe	Primary
5	Florida	Yes	Medicaid	Not severe	Primary
6	Florida	Yes	Medicaid	Not severe	Primary
7	Florida	No	Private	Not severe	n/a
8	Texas	Yes	Private	Not severe	Primary
9	Maryland	Yes	Private	Not severe	Non-primary
10	Arkansas	Yes	Private	Severe	Non-primary
Sources: [3–5]					

Client costs

To calculate client costs, we assume two separate components: out-of-pocket costs, which include co-payments associated with receiving medical treatment as well as transportation costs for both the patient and family members; and the opportunity costs associated with the overall illness of the patient as well as those experienced by family members due to hospitalizations.

As noted above, co-payments for each patient are available in the same publication utilized for direct treatment costs [7] and thus are assigned to each patient based on the relevant characteristics listed in Table 1. The average lengths of stay for hospitalizations are also available; we combine these with the average distance traveled to hospitals in the relevant Census district [9] with the medical mileage reimbursement rate in 2023 [10] and assume that the patient incurs one roundtrip in total and that the family incurs one roundtrip per each day hospitalized, i.e., we assume the family visits daily. In addition, we assume parking costs to be commensurate with mileage costs [11].

To calculate opportunity costs, we follow previous work [12] that calculated opportunity costs associated with obtaining malaria prophylaxis for travel applying average hourly earnings and including non-wage benefits and update the results here utilizing 2023 state-level median hourly earnings and their interquartile ranges [13]. Based on the literature [3–5, 7], we assume that patients were ill for an average of seven full (8-hour) days prior to seeking treatment and spent three full days recovering after receiving treatment. Thus, the total time a patient incurred opportunity costs is the sum of the illness time prior to seeking treatment, the time of hospitalization, and recovery time. For family members, we assume that, on average, one family member spends four hours visiting for each day a patient was hospitalized.

Public health response

There are several components to the costs related to the public health response: efforts by the Centers for Disease Control (CDC), and efforts for each of the four states affected. Responses included laboratory (e.g., testing for parasites in mosquitoes and patient blood samples); epidemiologic (e.g., active case surveillance and tracing); and entomologic (e.g., capturing mosquitoes for testing) activities. In addition, public health responses included public outreach to both people and providers; establishing communications; and vector control [14].

Detailed costs for the national response by the CDC and the state of Arkansas are available [15]; for the CDC, the costs include personnel costs, laboratory costs, and other costs (e.g., travel). These costs cover multiple activities, including genetic and molecular analyses on parasite strains to trace origins (identifying Central/South American and African signatures) and test vector pools; clinician outreach; surveillance and investigation; and public communications. For Arkansas, the costs include personnel costs (including those associated with outreach), some laboratory costs (including packaging to send samples to the CDC), mosquito surveillance activities, and mosquito mitigation activities.

Despite repeated attempts at contacting public health officials in Maryland and Texas, we were unable to obtain costs from either. Fortunately, there are significant similarities between Arkansas and these two states (see Table 2): each state had one case; there were similar case investigation and surveillance efforts; the departments undertook comparable mosquito surveillance and control efforts (e.g., number of sites); medical countermeasures assessments were similar; and there were analogous clinical and public outreach efforts. As such, we assume that the costs of the responses were comparable and adjust personnel costs for standard of living differences between states using state-level regional price parities [16] while maintaining other costs constant, assuming that they are associated with traded goods (i.e., traded across state lines).

Table 2. Description of state-level public health responses

State	Activities
Arkansas	*Case investigation/active case surveillance*: History of int'l travel, surveillance including household members; *Mosquito surveillance/control*: 5 traps @ 2 locations for 7 nights (sent to CDC for testing), spraying 5 nights close to residence; *Medical countermeasures assessment*: Saline County & Little Rock (diagnostic including RDTs, medications available); *Clinical & Public Outreach*: press release, health advisory, 1-hour webinar
Texas	*Case investigation/active case surveillance*: History of int'l travel, surveillance including household members; *Mosquito surveillance/control*: 4 locations used CDC light traps, 71 specimens collected/sent to CDC for testing; 5 adulticide treatments *Medical countermeasures assessment*: Information shared with infection control/emergency response partners + education/outreach for providers in general; *Clinical & Public Outreach*: state and county health advisories issued
Maryland	*Case investigation/active case surveillance*: History of int'l travel, surveillance including household members; *Mosquito surveillance/control*: Traps set, multiple rounds of larvicide and adulticide implemented (< 5 miles of residence); *Medical countermeasures assessment*: Active case finding in hospitals *Clinical & Public Outreach*: Public notice issued; Clinicians and public health officials alerted & provided recommendations to prioritize timely diagnosis, treatment, and public health reporting
Sources: [3–5]	

County officials in Sarasota and Manatee counties in Florida provided data on the costs for the public health response (Supplementary material 1). Sarasota county, where seven cases occurred, provided estimates on costs for the county and state. Manatee county, which successfully prevented any local cases from occurring, [17], provided one summary cost estimate. Costs for Sarasota county included detailed costs for mosquito surveillance and mitigation, as well as a description of further efforts including factsheets, software, and transit for larval inspections for which we add an average 7.5% (varying between 5%-10%) of surveillance and mitigation costs. In addition, Sarasota county provided a range of the number of personnel utilized during the time period of the response, May 17–October 30, 2023, all expending a 90% level of effort. A range of estimates for both the number of personnel and associated level of effort were also provided for the Florida Department of Health (FDoH). Because our Institutional Review Board exemption precluded obtaining individual-level salaries, we assume daily rates for Sarasota county and the FDoH staff based on the median salary for all employees [18] deflating to

2023 using a three percent rate and including fringe benefits and indirect costs [19]. Sensitivity analyses were performed using the ranges provided.

Health systems costs

We estimate two aspects of health systems costs incurred for the relatively low number of autochthonous malaria cases in 2023: blood bank testing and health systems-level physician training.

During summer 2023, a Level Yellow was triggered for Florida's Vector-Borne Pathogen Mitigation Strategy (VPMS), followed by a Level Orange, and then finally a Level Red which resulted in implementing protocols related to blood bank donations. Over the several weeks while the VPMS was implemented, in addition to increased donor screening and product management protocol, a total of 258 tests were conducted to test for the presence of malaria in the donor [20]. We multiply this by a unit cost for testing blood [21] to derive the total cost of blood bank testing. Note that no extra testing of blood bank supplies took place in Arkansas; we assume for the purposes of this paper that this was also the case in Maryland and Texas, given the similarity amongst the three states noted above.

In addition to the health systems costs incurred for testing blood donations, we also estimate physician training costs at the health systems level at $20,000. This figure is based on a grant received by the American College of Emergency Physicians (ACEP) for dengue fever to create the same type of educational materials and similar outreach efforts and overall engagement undertaken by ACEP during the autochthonous malaria outbreak.

Sensitivity analyses

Given that several variables in the analysis have some level of uncertainty, we incorporate a probabilistic sensitivity analysis here. We use plausible ranges for uncertainty bands for various inputs (e.g., public health response costs for Maryland and Texas, personnel costs for FDoH and Sarasota counties, direct medical treatment costs, some client costs) described in the relevant sections above. We conduct a Monte Carlo simulation analysis in Excel to simultaneously vary these uncertain inputs for 10,000 simulations and report the median estimated costs as well as the interquartile range.

Results

Overall, an estimated total of $2.4 million was spent to address the 10 autochthonous malaria cases in the US in 2023, resulting in an average cost per case of $242,960 (see Panel A of Table 3). The vast majority of the costs, slightly over $2 million (83.2%), were due to the public health responses at the federal level and in Florida, where seven of the 10 cases were located. The next highest cost was for direct medical treatment at $170,271 (7.0%), followed by several cost components of approximately $50,000 each (client costs, public health costs in Arkansas, Maryland, and Texas, approximately 2% each), with the lowest amount spent at the health systems level at $31,508 (1.3%). The distribution of

costs among components can also be seen in Fig. 1, which illustrates even more clearly the dominance of the federal and Florida public health responses.

Disaggregating the various cost components as appropriate and feasible, clearly the main cost driver is personnel costs for the public health response at approximately $1.75 million, or 71.8%. of total costs (see Panel B of Table 3). The second main cost driver is mitigation costs of $255,587 for the state and county public health responses, or 10.5% of total costs. The third main cost driver is total medical treatment costs of $170,271, or 7.0% of total costs, which

include personnel and other costs related to treatment including drugs. While client costs

(including both out-of-pocket and opportunity costs) and health systems costs (including both blood bank and physician education/communications costs) contribute less to overall costs, these costs are likely underestimated, a point we will return to in the Discussion section.

Finally, the sensitivity results indicate that even with the relatively wide confidence intervals provided, the total interquartile range for the median estimate of $2.4 million varies by approximately one percent between the first and third quartiles (see Panel C of Table 3), thus implying that the estimate of $2.4 million is relatively robust.

Discussion

Based on the available literature, key informant interviews and modeling assumptions, we find that the costs of responding to the 10 autochthonous malaria cases in the US in 2023 are approximately $2.4 million, or $242,960 per case. The public health response accounts for the vast majority of these costs; medical treatment, client costs (including out-of-pocket and opportunity costs) and health systems costs account for a relatively low percentage of total costs. Interestingly, while there were seven cases in Florida versus one case in Arkansas, the costs of the state and local public health response was 21 times greater in Florida than in Arkansas, rather than simply seven times greater, implying that a public health response increases exponentially rather than linearly when more cases are identified, although this pattern is based on limited data and warrants confirmation.

These estimates are likely a lower bound on the costs incurred. First, we use a conservative approach in estimating opportunity costs for clients, applying an average hourly wage to value time rather than calculating and applying the value of a statistical life year (VSLY), which would result in substantially higher opportunity costs [22]. Additionally, in our key informant interviews with the CDC, they explained that the federal costs were calculated beginning after the first Florida case was identified and ending before the Arkansas case, the last case, was identified. Thus, these costs are also a likely underestimate since they did not cover the full response time period. Furthermore, there are likely aspects of the public health and health system response that are not included due to a lack of evidence, such as the additional provider time needed to screen for malaria when encountering unexplained fever among non-travelers

and hospital administrator and provider time spent on communications and protocols the outbreak status.

We note that this study has several limitations. First, costs as described by CDC were based on a shorter time period, as noted above. Second, we do not include valuations of any donated goods, e.g., the donated spray truck, ultra-low volume sprayer, and adulticide from another municipality in Arkansas [3]; extrapolating these costs from the Florida reported mitigation costs implies, however, that these would add a minimal amount to the costs for Arkansas (and additionally to Maryland and Texas), on the order of approximately $2,400 (each). Third, we do not include nonmonetary client costs beyond opportunity costs such as costs due to disability and pain and suffering [23]; including these costs would increase client costs but would likely not increase overall costs substantially. Finally, certain assumptions had to be made, especially regarding wages in Florida; the sensitivity analysis performed, however, suggests that the impact of these assumptions is minimal relative to the overall cost.

Despite these limitations, the findings indicate substantial costs associated with the autochthonous malaria cases, at approximately $243,000 per case. Of perhaps even greater importance is that as the number of cases increased, the cost per case also increased more than proportionately, as a higher number of cases require a more intense response of surveillance and mitigation efforts. It is important to recognize that the *Anopheles* mosquitoes that can spread malaria, particularly *Anopheles freeborni* and *Anopheles quadrimaculatus*, are found throughout most of the continental US [24]. Should malaria become more prevalent in the US, there would be significant increases not only for treatment costs, but also for the public health response, applying the exponential nature of the response costs noted above. In addition, direct medical costs might increase due to increases in both the number and length of emergency department visits due to a fear of having contracted malaria, as well as increased use of malaria prophylaxis for domestic purposes. At the health systems level, formularies would have to change to stock malaria-related tests and drugs, and ongoing training and information materials would have to be developed and provided to both frontline workers and the general public. There would also likely be an impact on local economies due to a decrease in tourism, as tourists may be deterred from visiting areas due to fear of contracting a vector-borne disease.

These cost estimates should also be interpreted against a backdrop of broader climatic and entomological uncertainty. Recent evidence indicates that climate change has already begun reshaping malaria risk on a population scale, with increased malaria prevalence in cooler, higher-elevation regions of East and southern Africa, even as it has suppressed transmission in already-hot parts of West and Central Africa where temperatures now exceed the thermal optimum for vector survival [25]. This spatial redistribution of malaria risk is compounded by ongoing changes in vector ecology. The invasive mosquito *Anopheles stephensi*, unlike Africa's historically dominant malaria vectors, breeds readily in the small, human-made water containers and can persist in urban environments [26]. While *Anopheles stephensi* has not been detected in the continental United States, its demonstrated ability to establish in new urban environments, combined with warming trends that may broaden the range of climate suitable

for *Anopheles* vectors more generally, underscores the importance of continued entomological surveillance as a component of any longer-term cost projection for malaria control in the US.

In contrast to the high costs for the response to the 10 local malaria cases in 2023, most malaria control efforts have been found to be highly cost-effective. For example, a 2021 systematic review found that vector control efforts cost between $1.18 and $5.70 per person year protected in 2018 USD [27]. Another 2025 study found that the US government's malaria funding resulted in a cost of $24.11 per malaria case averted and prevented $139.7 per case averted in GDP losses [28]. While the domestic and international prevention and treatment costs are not meant to be directly comparable, it is clear that continued investments to prevent vector-borne diseases domestically as well as limit them abroad are critical for public health. Plans to release millions of sterile mosquitoes in Florida to reduce dengue fever and West Nile virus [29] and other novel vector control and surveillance methods are aimed at staying ahead of the shifting malaria landscape.

Conclusions

In summary, the approximately $2.4 million, or $242,960 per case for the 2023 malaria outbreak estimate derived in this study is likely to be a small fraction of the actual cost per case if autochthonous malaria were to become more prevalent in the United States. These estimates describe a conservative estimate in a year when containment succeeded. As such continued investments to prevent the spread of malaria both domestically and abroad are crucial to improving health and economic wellbeing.

Abbreviations

United States (US)

Centers for Disease Control (CDC)

Florida Department of Health (FDoH).

Vector-Borne Pathogen Mitigation Strategy (VPMS)

American College of Emergency Physicians (ACEP)

Value of a Statistical Life Year (VSLY),

Declarations

Ethics approval and consent to participate

All key informant interviewees provided informed consent. This research was determined to be exempt from Institutional Review Board review by BRANY's Social, Behavioral, and Educational Research IRB #273845 under 'Exempt 2(i)(a): Information is recorded anonymously' and 'Exempt 2(ii)(a): Responses

may be identifiable, but any disclosure outside the research would not reasonably place subjects at risk of criminal/civil liability or damage their financial standing, employability, or reputation.'

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

NB developed the research methodology, analyzed and interpreted the data, and reviewed and edited the manuscript. LAB developed the research methodology, analyzed and interpreted the data, and prepared the manuscript. Both authors read and approved the final manuscript before submission.

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Not applicable.

Data Availability

All data analyzed during this study are either in the published literature or other publicly available data sources, as listed in the References section, or are contained in the supplementary file.

References

1. 1. World Health Organization. World malaria report 2025: addressing the threat of antimalarial drug resistance. Geneva: World Health Organization. Available at: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2025. Accessed 05 November 2026.
2. 2. Centers for Disease Control and Prevention. Data and Statistics on Malaria in the United States. Atlanta: Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/malaria/php/surveillance-report/index.html. Accessed 05 November 2026.

3. 3. Courtney AP, Boyanton BL Jr, Strebeck PV, Blount K, Ledford S, Ridpath AD, Mace KE, Smith C, Garner K, Waters C, Cima MJ, Patil N, McElroy PD, Raphael BH, Sapp SGH, Qvarnstrom Y, Lenhart A, Sutcliffe A; Arkansas Locally Acquired Mosquito-Transmitted Malaria Response Team; Dulski TM, Rothfeldt L. Locally Acquired (Autochthonous) Mosquito-Transmitted Plasmodium vivax Malaria - Saline County, Arkansas, September 2023. MMWR Morb Mortal Wkly Rep. 2024 Oct 24;73(42):646–649. doi: 10.15585/mmwr.mm7342a2.
4. 4. Blackburn D, Drennon M, Broussard K, Morrison AM, Stanek D, Sarney E, Ferracci C, Huard S, Brennan W, Eaton J, Nealeigh S, Barber N, Zimler RA, Adams JN, Blackmore C, Gordillo M, Mercado R, Vore H, Scanlan K, Motie I, Stanfield L, Farooq A, Widel K, Tomson K, Kerr N, Nasir J, Cone M, Rice C, Larkin T, Hernandez E, Bencie J, Lesser CR, Dersch M, Ramirez-Lachmann S, Clark M, Rollo S, Bashadi A, Tyler R, Bolling B, Moore B, Sullivan B, Fonken E, Castillo R, Gonzalez Y, Olivares G, Mace KE, Sayre D, Lenhart A, Sutcliffe A, Dotson E, Corredor C, Rogers E, Raphael BH, Sapp SGH, Qvarnstrom Y, Ridpath AD, McElroy PD. Outbreak of Locally Acquired Mosquito-Transmitted (Autochthonous) Malaria - Florida and Texas, May-July 2023. MMWR Morb Mortal Wkly Rep. 2023 Sep 8;72(36):973–978. doi: 10.15585/mmwr.mm7236a1.
5. 5. Duwell M, DeVita T, Torpey D, Chen J, Myers RA, Mace K, Ridpath AD, Odongo W, Raphael BH, Lenhart A, Tongren JE, Stanley S, Blythe D. Notes from the Field: Locally Acquired Mosquito-Transmitted (Autochthonous) Plasmodium falciparum Malaria - National Capital Region, Maryland, August 2023. MMWR Morb Mortal Wkly Rep. 2023 Oct 13;72(41):1123–1125. doi: 10.15585/mmwr.mm7241a3.
6. 6. Andrade MV, Noronha K, Diniz BPC, Guedes G, Carvalho LR, Silva VA, Calazans JA, Santos AS, Silva DN, Castro MC. The economic burden of malaria: a systematic review. Malar J. 2022 Oct 5;21(1):283. doi: 10.1186/s12936-022-04303-6.
7. 7. Park J, Joo H, Maskery BA, Alpern JD, Weinberg M, Stauffer WM. Costs of malaria treatment in the United States. J Travel Med. 2023 May 18;30(3):taad013. doi: 10.1093/jtm/taad013.
8. 8. U.S. Bureau of Labor Statistics. Consumer Price Index for All Consumers: Medical care in U.S. city average [CUUR0000SAM], retrieved from: https://data.bls.gov/toppicks?survey=cu Accessed 05 November 2026.
9. 9. Weiss AJ, Pickens G, Roemer M. Methods for Calculating Patient Travel Distance to Hospital in HCUP Data. HCUP Methods Series Report # 2021-02 ONLINE. December 6, 2021. U.S. Agency for Healthcare Research and Quality. Available: www.hcup-us.ahrq.gov/reports/methods/methods.jsp. Accessed 05 November 2026.
10. 10. U.S. Internal Revenue Service. Standard mileage rates: Medical, retrieved from: https://www.irs.gov/tax-professionals/standard-mileage-rates. Accessed 05 November 2026.
11. 11. Liyana Arachige M, Tse WC, Zhang R, Ma H, Singhal S, Phan T. Estimating the cost of visiting hospital outpatient. BMJ Neurol Open. 2024 Feb 17;6(1):e000576. doi: 10.1136/bmjno-2023-000576.

12. 12. Adachi K, Coleman MS, Khan N, Jentes ES, Arguin P, Rao SR, LaRocque RC, Sotir MJ, Brunette G, Ryan ET, Meltzer MI; Global TravEpiNet Consortium. Economics of malaria prevention in US travelers to West Africa. Clin Infect Dis. 2014 Jan;58(1):11–21. doi: 10.1093/cid/cit570. Epub 2013 Sep 6.
13. 13. U.S. Bureau of Labor Statistics. State Occupational Employment and Wage Estimates, retrieved from: https://www.bls.gov/oes/2023/may/oes_fl.htm. Accessed 05 November 2026.
14. 14. DeVita TN, Morrison AM, Stanek D, Drennon M, Sarney E, Brennan W, Tomson K, Blackmore C, Broussard K, Duwell M, Blythe D, Rothfeldt L, Dulski T, Blount K, Ledford S, Blackburn D, Wallender E, Barratt JLN, Raphael BH, Lenhart AE, Ridpath AD, Mace KE, Williams SG, Beard CB, Parise ME, McElroy PD. Public Health Response to the First Locally Acquired Malaria Outbreaks in the US in 20 Years. JAMA Netw Open. 2025 Oct 1;8(10):e2535719. doi: 10.1001/jamanetworkopen.2025.35719. [15] Cotte AH, Tongren E, Dulski TM, Rothfeldt L, Meltzer MI, Blount K, Garner K, Porter A, Raphael BH, Sutcliffe AC, Ridpath AD, Williams S, McElroy PD. Public Health Response and Healthcare Costs of the 2023 U.S Outbreak of Locally Acquired Mosquito-Transmitted Malaria: National and Arkansas State Perspectives. Emerg Infect Dis 2026.
15. 16. U.S. Bureau of Economic Analysis. GDP by State, retrieved from https://www.bea.gov/data/gdp/gdp-state. Accessed 05 November 2026.
16. 17. Manatee County Mosquito Control District. History of Mosquito Control in Florida. Available at: https://www.manateemosquito.com/history/. Accessed 05 November 2026.
17. 18. State of Florida. Employee Salaries, retrieved from: https://salaries.myflorida.com/?format=csv. Accessed 05 November 2026.
18. 19. Research Services. Proposal Preparation & Submission: Budgeting. University of Florida, retrieved from: https://research.ufl.edu/services/dsp/proposals/budgeting/fa-rates-idc/fa-bases. Accessed 05 November 2026.
19. 20. Sullivan DJ, Lanteri MC, Bres V, Hanhan M, Pagan M, Rey A, Thomas K, Reik RA. Heightened Nontesting Risk Mitigation Blood Donor Screening with Retrospective Transcription-Mediated Amplification Testing during a 2023 Autochthonous Florida Malaria Cluster. Am J Trop Med Hyg. 2025 Dec 9;114(2):305–311. doi: 10.4269/ajtmh.25-0139.
20. 21. Janssen MP, Nuebling CM, Lery FX, Maryuningsih YS, Epstein JS. A WHO tool for risk-based decision making on blood safety interventions. Transfusion. 2021 Feb;61(2):503–515. doi: 10.1111/trf.16231. Epub 2020 Dec 25.
21. 22. Robinson, Lisa A. and Hammitt, James K. and Cecchini, Michele and Chalkidou, Kalipso and Claxton, Karl and Cropper, Maureen L. and Eozenou, Patrick and de Ferranti, David and Deolalikar, Anil B. and Campos Guanais de Aguiar, Frederico and Jamison, Dean T. and Kwon, Soonman and Lauer, Jeremy Addison and O'Keeffe, Lucy and Walker, Damian and Whittington, Dale and Wilkinson, Thomas and Wilson, David and Wong, Brad. Reference Case Guidelines for Benefit-Cost Analysis in Global Health and Development (May 1, 2019). Available at SSRN: https://ssrn.com/abstract=4015886 or http://dx.doi.org/10.2139/ssrn.4015886. Accessed 05 November 2026.

22. 23. Abimbola TO, Symum H, Van Handel M, Teshale E, Thompson W. Lifetime medical costs of chronic hepatitis C in the United States. BMC Health Serv Res. 2026 Mar 21;26(1):609. doi: 10.1186/s12913-026-14360-1.
23. 24. Centers for Disease Control. About mosquitoes in the United States. Available at: https://www.cdc.gov/mosquitoes/about/about-mosquitoes-in-the-united-states.html. Accessed 05 November 2026.
24. 25. Carlson CJ, Carleton T, Odoulami RC, Molitor CD, Trisos CH. The past and future impact of climate change on childhood malaria in Africa. Nature. 2026 Sep;657(8131):487–494. doi: 10.1038/s41586-026-10840-w. Epub 2026 Jul 29.
25. 26. Zhou G, Zhong D, Yewhalaw D, Yan G. Anopheles stephensi ecology and control in Africa. Trends Parasitol. 2024 Feb;40(2):102–105. doi: 10.1016/j.pt.2023.11.011. Epub 2023 Dec 22.
26. 27. Conteh L, Shuford K, Agboraw E, Kont M, Kolaczinski J, Patouillard E. Costs and Cost-Effectiveness of Malaria Control Interventions: A Systematic Literature Review. Value Health. 2021 Aug;24(8):1213–1222. doi: 10.1016/j.jval.2021.01.013. Epub 2021 May 18.
27. 28. Oxford Economics Africa. The economic impact of US funding for malaria: Assessing the direct and indirect benefits over the last two decades. Commissioned by Malaria No More. Available at: https://www.oxfordeconomics.com/resource/the-economic-impact-of-us-funding-for-malaria/. Accessed 05 November 2026.
28. 29. Google. *How we stop bad bugs*. Available at: https://debug.com/how. Accessed 05 November 2026.

Footnotes

1. The exception to this is the patient in Arkansas, who was reported to have been ill for 11 days before seeking treatment [3].
2. Level Yellow: At least one autochthonous case in a county in a 70-day period; Level Orange: 2–5 autochthonous cases in one zip code in a 70-day period; Level Red: At least 6 autochthonous cases in one zip code in a 70-day period [20].
3. In addition to assumptions described in the Methods section, we assume here that Manatee County costs, reported as a lump sum, are distributed the same as Sarasota County costs.

Figures

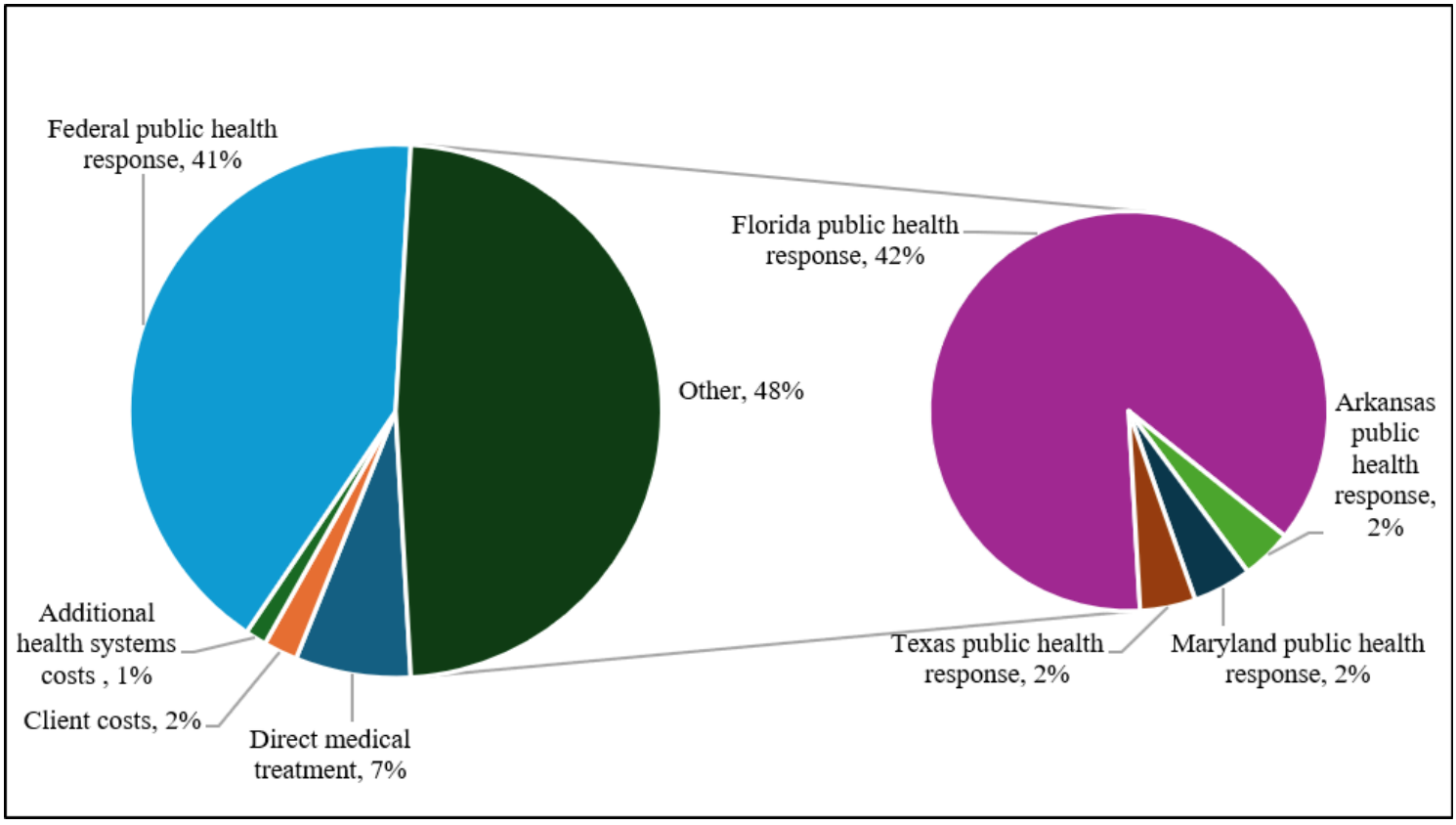

Figure 1

Costs of autochthonous malaria cases in 2023 in the US

Supplementary Files

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- Supplementarymaterial1ResponsestoFloridaFOIArequests.pdf
- floatimage1.jpeg