

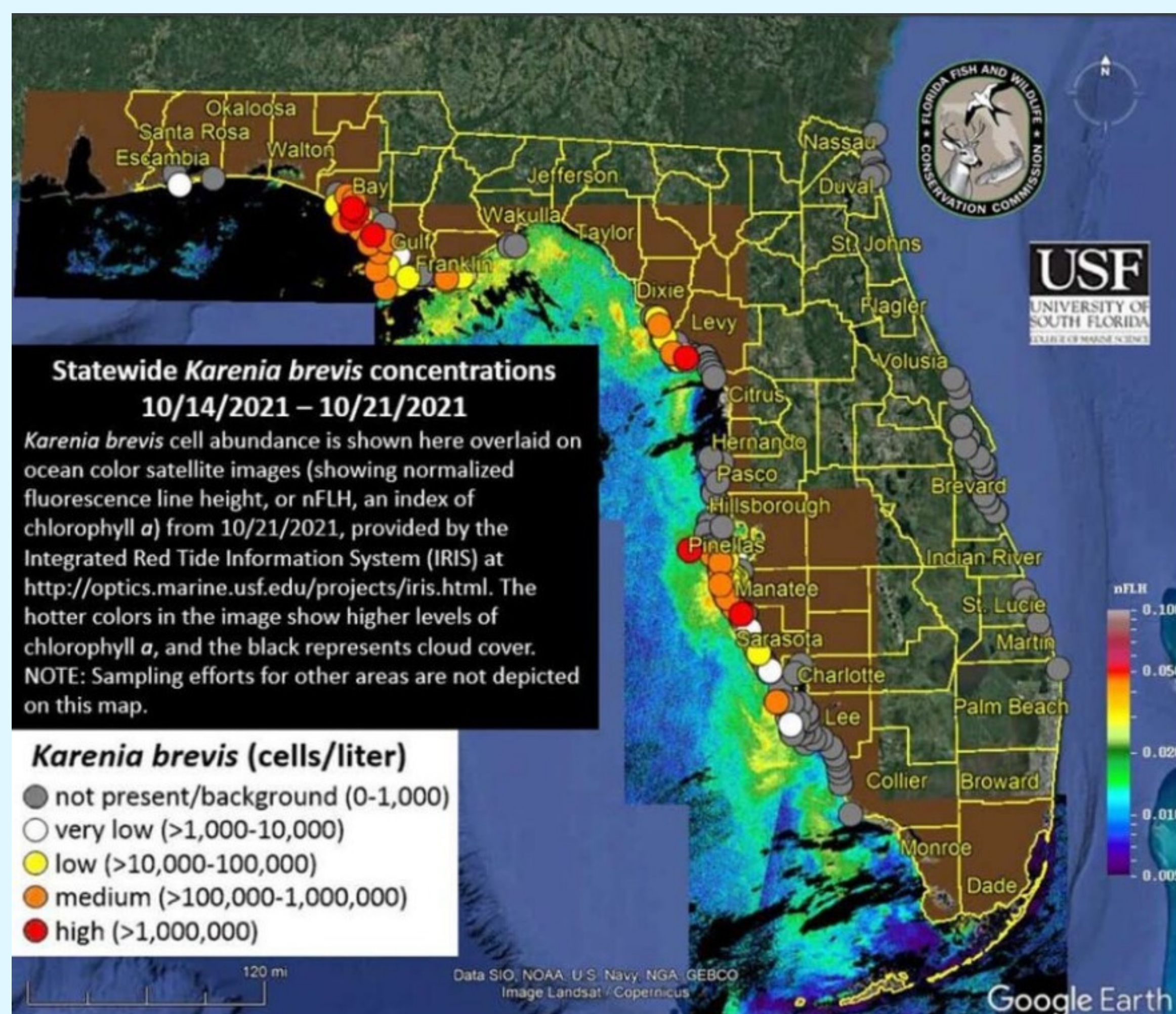
# Investigating the Impacts of Red Tide on Public Health Within the Gulf of America: A Meta-Analysis

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## Introduction



- *Karenia brevis* blooms are a recurring environmental hazard along Florida's Gulf Coast, particularly across the West Florida Shelf (WFS)
- Brevetoxin is a neurotoxin linked to throat irritation, wheezing, and asthma exacerbation, impacting coastal populations through inhalation.

## Objective

Question: How does the severity of a harmful algal bloom translate to public health outcome?

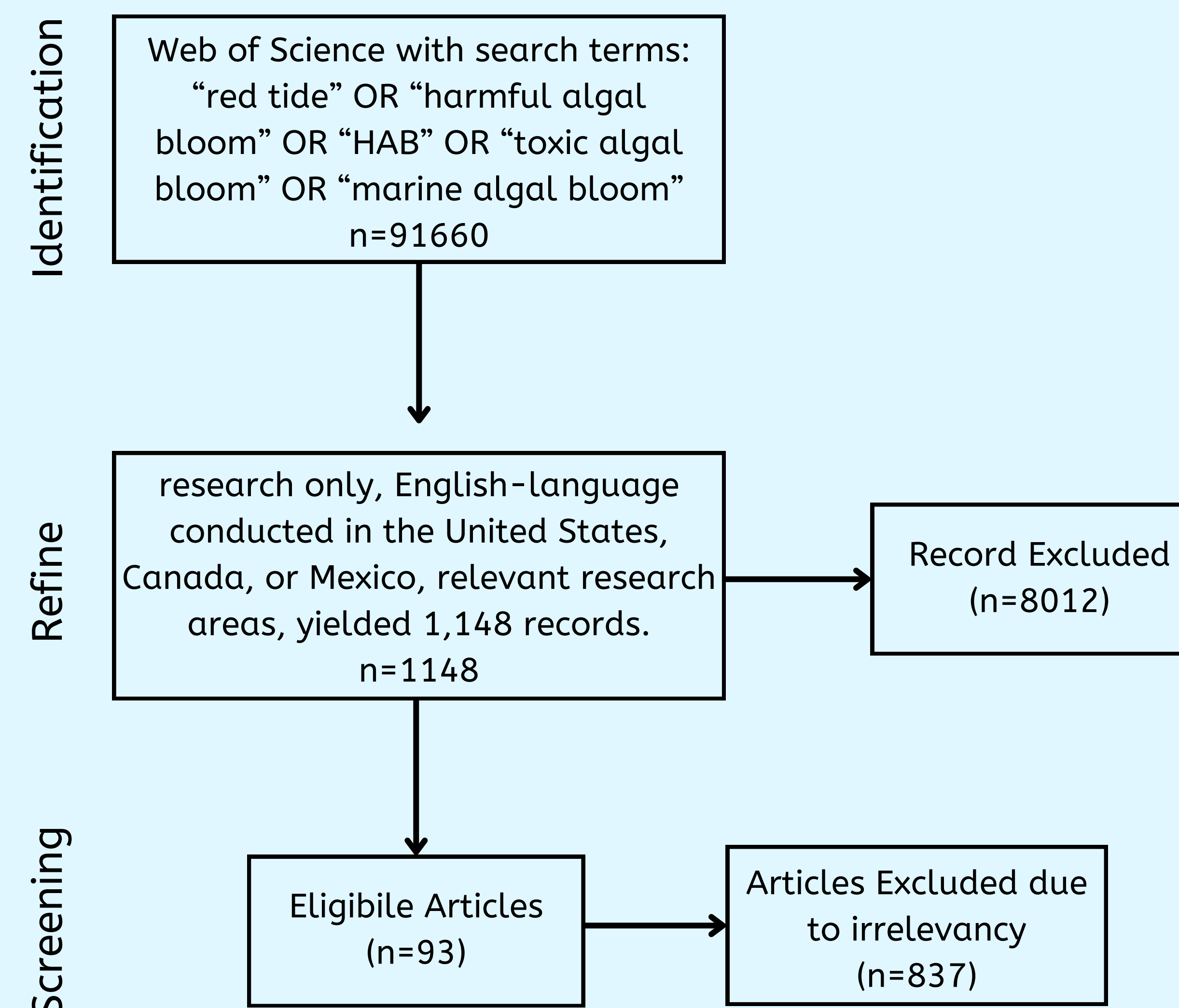
Hypothesis: Increased bloom severity and duration negatively impacts general public health.

## Acknowledgments And References

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## Meta-Analysis



## Findings + Discussion

| Category          | Subcategory                                                          | Number of Studies (n) |
|-------------------|----------------------------------------------------------------------|-----------------------|
| Health Outcomes   | Respiratory symptoms (cough, throat irritation, asthma exacerbation) | 9                     |
|                   | Lung function decline (FEV <sub>1</sub> , PEF reduction)             | 6                     |
|                   | Eye irritation / conjunctival symptoms                               | 3                     |
|                   | Skin irritation / dermatological effects                             | 2                     |
|                   | Gastrointestinal symptoms                                            | 2                     |
|                   | Mixed or general health effects                                      | 7                     |
| Exposure Pathways | Inhalation of aerosolized brevetoxins (sea spray / aerosol exposure) | 11                    |
|                   | Recreational water contact                                           | 5                     |
|                   | Seafood ingestion (bioaccumulated brevetoxins)                       | 3                     |
|                   | Mixed exposure pathways (multiple routes)                            | 4                     |
|                   | Environmental HAB exposure (general environmental exposure)          | 6                     |

Table 1. Summary of reported health outcomes and exposure pathways in studies examining the human health impacts of harmful algal blooms (HABs), particularly *Karenia brevis* red tide events. Respiratory symptoms and lung function decline were the most frequently reported health outcomes, largely associated with inhalation exposure to aerosolized brevetoxins.

## Findings + Discussion

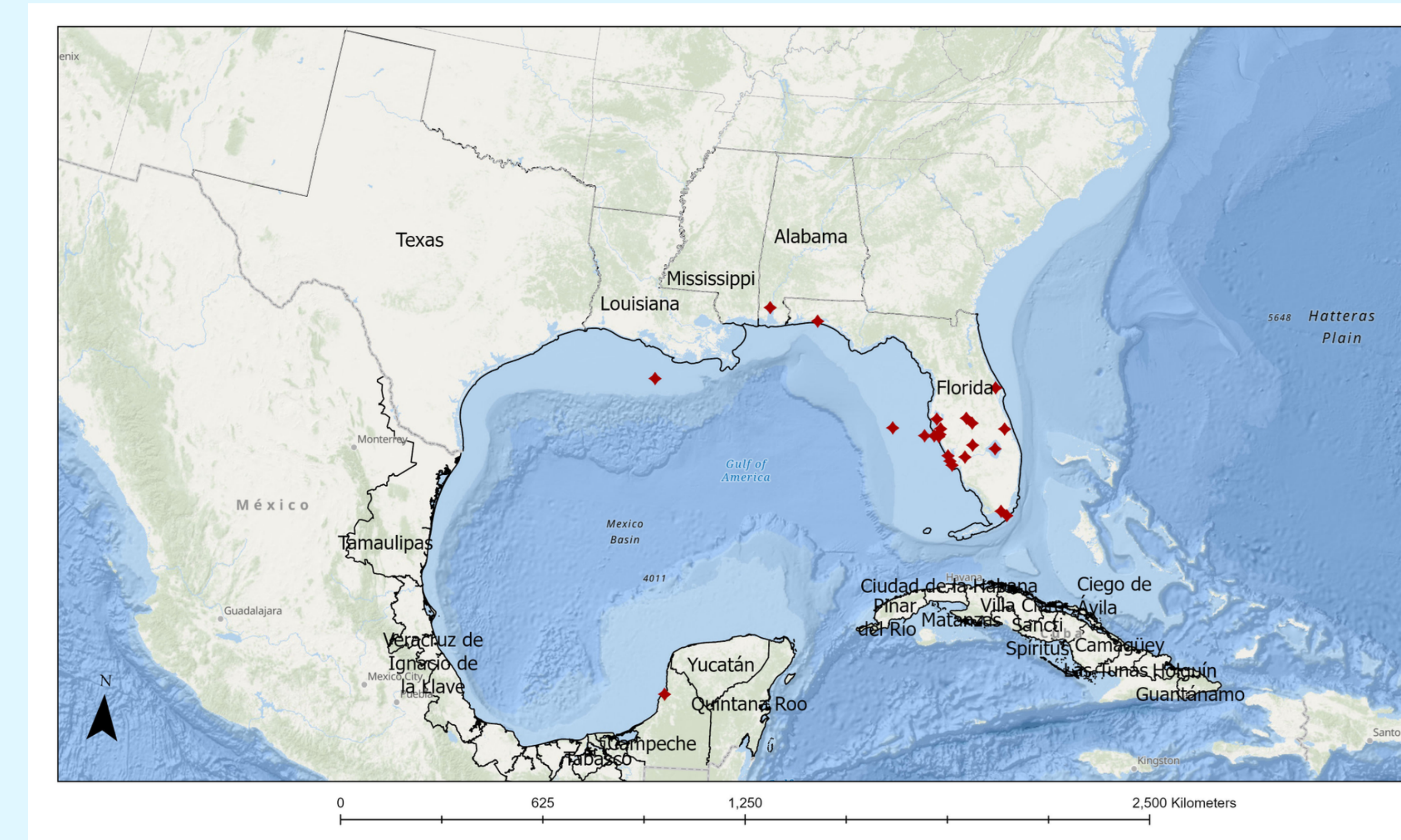


Figure 2. Geographic distribution of studies examining human health impacts associated with harmful algal blooms (HABs), particularly *Karenia brevis* red tide events. Study locations are concentrated along the southwest Florida Gulf Coast where red tide blooms frequently occur.

Although our findings are preliminary and no conclusive results are presented, there seems to be a strong positive correlation between stronger bloom seasons and a higher rate of public health concern. Prior literature on harmful algal blooms (HABs), particularly *K. brevis*, suggests that higher bloom concentrations are linked to greater environmental toxin exposure and a higher likelihood of clinical manifestations such as respiratory irritation and gastrointestinal distress. Based on these findings, it is plausible that bloom severity and duration may contribute to measurable variation in public health outcomes. Further analysis could evaluate these relationships across bloom events to determine whether consistent exposure patterns emerge.

## Conclusions and Future Work

Harmful algal blooms (HABs), especially *Karenia brevis* red tide events, are associated with public health risks along the West Florida Shelf and beyond. The most commonly reported impacts were respiratory symptoms such as coughing, throat irritation, and asthma exacerbation, mainly linked to inhalation of aerosolized brevetoxins. Other symptoms, including eye, skin, and gastrointestinal irritation, were reported less often.

Future research should examine long-term health effects of HAB exposure as well as linking environmental data and hospital visits due to HAB exposure. These findings can help public health agencies improve warning systems and reduce exposure risks for coastal communities.