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REVEALING THE IMPACT ON CUBA-US COLLABORATION IN HEALTH SCIENCES: INCLUSION OF CUBA IN THE LIST OF COUNTRIES THAT SPONSOR TERRORISM

DESVELANDO EL IMPACTO EN LA COLABORACIÓN CUBA-EE.UU. EN CIENCIAS DE LA SALUD: INCLUSIÓN DE CUBA EN LA LISTA DE PAÍSES PATROCINADORES DEL TERRORISMO

Guillermo Armando Ronda-Pupo
Universidad Católica del Norte, Chile
gronda@ucn.cl
https://orcid.org/0000-0002-9049-8249

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ABSTRACT

Objective: This study explores the intricate interplay between Cuba's placement on the state sponsors of terrorism list and its impact on scientific collaboration with the United States, specifically in Health Sciences. **Design/Methodology/Approach:** Using a robust Poisson regression framework, the investigation examines collaboration dynamics in two scenarios: when Cuba is designated a terrorism sponsor (group 1) and when it's not (group 0). **Results/Discussion:** Outcomes reveal the pivotal role of Cuba's terrorism listing in shaping collaboration between nations. A negative coefficient for "Inclusion" indicates a 69% reduction in expected joint scientific articles when Cuba is listed as a terrorism sponsor. **Conclusions**: These findings highlight the interplay between geopolitical factors and scientific partnerships, with implications for policymakers and researchers. They underscore the need to consider broader consequences of such designations. **Originality/Value:** By shedding light on the complex convergence of science and diplomacy, this research underscores the urgency of fostering productive scientific discourse. It propels Health Sciences towards progress, even in a world of diplomatic shifts. These insights guide collaborative efforts in Health Sciences, emphasizing the importance of navigating challenging geopolitical landscapes.
KEYWORDS: Health Sciences; International collaboration; Research Policy; Science Diplomacy; Scientific collaboration

RESUMEN

Objetivo: Este estudio explora la intrincada interacción entre la ubicación de Cuba en la lista de estados patrocinadores del terrorismo y su impacto en la colaboración científica con los Estados

Unidos, específicamente en Ciencias de la Salud. **Diseño/Metodología/Enfoque:** Utilizando un marco robusto de regresión de Poisson, la investigación examina la dinámica de colaboración en dos escenarios: cuando Cuba es designada patrocinadora del terrorismo (grupo 1) y cuando no lo es (grupo 0). **Resultados/Discusión:** Los resultados revelan el papel fundamental de la inclusión de Cuba en la lista de terrorismo en la configuración de la colaboración entre naciones. Un coeficiente negativo para "Inclusión" indica una reducción del 69% en los artículos científicos conjuntos esperados cuando Cuba figura como patrocinador del terrorismo. **Conclusiones** : Estos hallazgos resaltan la interacción entre factores geopolíticos y asociaciones científicas, con implicaciones para los responsables de políticas y los investigadores. Subrayan la necesidad de considerar consecuencias más amplias de tales designaciones. **Originalidad/Valor:** Al arrojar luz sobre la compleja convergencia de la ciencia y la diplomacia, esta investigación subraya la urgencia de fomentar un discurso científico productivo. Impulsa las Ciencias de la Salud hacia el progreso, incluso en un mundo de cambios diplomáticos. Estos conocimientos guían los esfuerzos de colaboración en Ciencias de la Salud, enfatizando la importancia de navegar por paisajes geopolíticos desafiantes.
PALABRAS CLAVE : Ciencias de la Salud; Colaboración internacional; Política de Investigación; Diplomacia científica; Colaboración científica

INTRODUCTION

The pursuit of scientific knowledge and the advancement of global health are inherently collaborative endeavors that transcend borders and political differences (DeWeerdt, 2001). Throughout history, scientific collaborations between nations have proven to be powerful catalysts for progress, fostering the exchange of ideas, expertise, and resources. One such collaboration that has shown great promise is the partnership between Cuba and the United States in the field of Health Sciences (Abreu et al., 2017; Carbonell & Hill, 2015b; Chapman et al., 2018; Demain, 2009; Heger, 2016; Hogue, 2016; Pastrana, 2015; S. J. Pastrana et al., 2018; Wren, 2014).

For decades, despite their political differences, Cuba and the United States have engaged in joint efforts to address public health challenges and promote scientific breakthroughs in the health sector (Canete & Goodman, 2015; Carbonell & Hill, 2015b; Chapman et al., 2018; Heger, 2016; Hogue, 2016; Keck, 2016; O'Connell et al., 2018; Scott et al., 2018). These collaborations have been especially crucial in areas such as neuroscience (Heger, 2016) biotechnology (Carbonell & Hill, 2015a; Demain, 2009), bioethics (Canete & Goodman, 2015), cancer, public health, infectious diseases Dengue and Chikungunya, immunology (Wren, 2014), gastroenterology (Abreu et al., 2017) tuberculosis eradication (Chapman et al., 2018). However, the dynamics of this scientific partnership underwent a significant shift when Cuba was designated as a state sponsor of terrorism by the United States (Fink et al., 2014).

The decision to include Cuba on the list of state sponsors of terrorism in 1981 raised numerous questions and concerns about its potential impact on various aspects of the Cuba-US relationship, particularly in scientific cooperation (DeWeerdt, 2001; S. Pastrana et al., 2018; Pastrana, 2015). This inclusion brought forth a wave of challenges, including economic sanctions, travel restrictions, and limited access to research funding and resources (D'Alvare, 2019; DeWeerdt, 2001; Pastrana, 2015). Consequently, it had the potential to disrupt and alter the previously thriving health sciences collaboration between the two nations.

The objective of this study is to delve into the effects of Cuba's inclusion in the list of states sponsors of terrorism on the Cuba-US scientific collaboration in the field of Health Sciences. By examining the before and after scenarios, we aim to gain a comprehensive understanding of the implications of this political action on scientific research, knowledge sharing, and the overall progress of collaboration in health sciences in both countries.

In this research, we will focus on the period following Cuba's inclusion in the terrorism list, 1981 through 2015, when it was excluded 2016-2020, and its inclusion again in 2021 up to present day. We will explore how the designation impacted existing scientific partnerships, ongoing research projects, and joint initiatives between Cuban and US institutions in the health sciences field.

Research Question: How does Cuba's classification as a state sponsor of terrorism shape the dynamics of collaborative scientific initiatives between Cuba and the United States in the realm of Health Sciences? What specific repercussions arise from this influence for the health scientific community, the advancement of scientific knowledge, and the broader international relations landscape of the two nations?

This study contributes to understanding the relationship between political actions and scientific cooperation. The findings may shed light on the fragility of international scientific collaborations and highlight the importance of fostering an environment conducive to scientific advancement, even amid political tensions. Furthermore, this research may offer valuable insights for policymakers, diplomatic officials, and healthcare leaders to navigate the complexities of maintaining and revitalizing scientific partnerships in the face of political challenges.

The impact of Cuba's inclusion on the list of countries sponsors of terrorism on Cuba-US health sciences collaboration is a topic of importance, touching upon various aspects of science, diplomacy, and international relations. Through a meticulous examination of the consequences of this designation, we hope to contribute to a better understanding of the intricacies involved in preserving scientific collaboration between nations facing political discord.

METODOLOGY

Data

The dataset comprises collaborative publications involving scientists from both Cuba and the United States during the period from 1981 to 2023. These publications are drawn from the WoS (Web of Science) databases within the field of Health Sciences. The dataset was gathered as of August 2, 2023.

The choice of the Health Sciences field for examination is underpinned by compelling factors that resonate both historically and quantitatively. Notably, this field stands as the cornerstone of an impressive 37% of the Cuba-U.S. scientific collaborative endeavors in the period analyzed. However, its significance extends far beyond mere statistics.

Intriguingly, this field carries a rich legacy of collaboration that traces its origins back to the 1800s. A pivotal figure, Cuban naturalist Felipe Poey, exemplified this early tradition by entrusting a wealth of meticulously collected specimens and research findings on fish species from Cuban waters to prestigious U.S. institutions like the Smithsonian and Harvard University (DeWeerdt, 2001).

The late 19th Century marked a watershed moment with the scientific partnership between Cuban luminary Carlos Finlay and Jesse Lazear from Johns Hopkins University. Their collaborative efforts provided compelling validation to Finlay's pioneering theories, initially advanced two decades earlier, regarding mosquitoes as vectors for the transmission of yellow fever (S. J. Pastrana et al., 2018). This landmark collaboration forged an enduring bridge between the scientific communities of the United States and Cuba.

These historical threads of collaborative inquiry, woven across time, have indelibly set the stage for a profound and enduring connection between scientists in both nations. As we delve into the dynamics of the Health Sciences domain, we simultaneously engage with a legacy that not only shapes the present but also kindles the potential for innovative cross-border collaboration in the future.

To extract the relevant data, we employed the Advanced Search feature within the WoS Core Collection. The query involved specifying CU = (Cuba) and PY = 1981-2023, with a focus on document types such as articles, reviews, proceedings papers, letters, and notes. Additionally, we selected the following Citation Indexes: Science Citation Index Expanded, Social Science Citation Index, and Arts & Humanities Citation Index. Notably, the Emerging Sources Science Citation Index was omitted due to its indexing of documents solely from 2015 onwards, which could potentially introduce bias.

Subsequent to data retrieval, our analysis entailed filtering the outcomes by employing the "Country/region" label. This filtering allowed us to identify Cuban-authored papers that were collaboratively published with the involvement of at least one researcher from the United States. https://www.webofscience.com/wos/woscc/summary/0ffd7557-de03-448f-a92c-4f3a76350745-9c3b49f0/date-ascending/1

The data curation process involved utilizing the Science Metrix journal classification to identify collaborative papers between Cuba and the US within the field of Health Sciences. We opted for this approach due to several compelling reasons.

Firstly, the Science Metrix journal classification is openly accessible to the bibliometric community under a creative commons license. It benefits from contributions by experienced bibliometricians, making it a trusted and comprehensive resource. This classification is constructed based on established journal classifications like ISI, CHI, and ERA, which lends credibility to its categorization. Moreover, the journal groupings within this classification act as reference points, guiding the allocation of journals to corresponding fields (Archambault et al., 2015).

Each individual journal and paper were methodically assigned to a distinct field or subfield within the health sciences domain using the Science Metrix journal classification. This classification methodology closely aligns with the NSF (National Science Foundation) journal classification system. Through a hybrid approach that combines algorithmic techniques and expert evaluation, each journal and its associated papers were meticulously matched to a single, mutually exclusive domain, field, or subfield.

The Science Metrix classification schema encompasses 4 fields namely, Biomedical research, Clinical Medicine, Psychology & Cognitive Sciences, and Public Health & Health Services, each of which can be thoughtfully aggregated into 48 overarching subfields. This structured classification framework facilitates our investigation by providing a coherent and consistent foundation for organizing the research papers under consideration.

Temporal Framework

The temporal framework is defined based on the instances when Cuba was included or excluded from the list of countries considered terrorism sponsors. Thus, the time frame covers the period from 1981, when Cuba was included in the list, until 2015. From 2016 to 2020, the period during which Cuba was excluded from the list. From 2021, when Cuba was re-included in the list, to the present date (August, 2, 2023).

Experiment

Dependent variable

Scientific collaboration. scientific collaboration could be defined as the working together of researchers to achieve the common goal of producing new scientific knowledge (Katz & Martin, 1997). Scientific collaboration yields a multitude of advantageous outcomes, encompassing the seamless sharing of knowledge, skills, and techniques, facilitating the transfer of expertise. This

dynamic exchange often leads to a convergence of diverse viewpoints, igniting a collective intellectual spark that fosters innovation and creativity (Rodriguez Miramontes & Gonzalez-Brambila, 2016; Wagner et al., 2017). The number of papers U.S – Cuba coauthored in a year. Cuba and the US have common research interest that could favor enhancing their mutual scientific collaboration (Canete & Goodman, 2015, 2021; Carbonell & Hill, 2015b; DeWeerdt, 2001; Echegoyen, 2002; Heger, 2016; Hogue, 2016; Machlis et al., 2012; O'Connell et al., 2018; Scott et al., 2018).

For the present study collaboration is the number of Cuba – U.S coauthored papers is a year. Co-authorship is one of the most widely used measures to quantify scientific collaboration in research publications (Batista et al., 2018; Kahn, 2018; Katz & Martin, 1997). When researchers collaborate on a scientific paper, they are listed as co-authors, signifying their contribution to the study. The number of co-authors on a paper reflects the extent of collaboration, and each co-author represents a link in the collaborative network.

Independent variable

Inclusion of Cuba the list of state sponsors of terrorism. The independent variable of whether Cuba is designated as a state sponsor of terrorism. In order to facilitate quantitative analysis, the inclusion of Cuba on the list is represented through coding: a value of 1 is assigned when Cuba is designated as a state sponsor of terrorism, and conversely, a value of 0 is assigned when it is not on the list.

This variable is of paramount importance in examining the intricate dynamics of international relations and the geopolitical landscape. The comprehensive analysis of global issues, provides an ideal platform to explore how the inclusion or exclusion of a nation like Cuba on the state sponsors of terrorism list can have far-reaching consequences. By delving into this variable, the study sheds light on the multifaceted impacts on diplomatic interactions, foreign policies, and broader global security frameworks, specifically its influence on scientific collaboration on the field Health Sciences.

Mathematical procedures

To determine causality in the relationship between Cuba's inclusion in the list of Countries sponsors of terrorism and collaboration in the field of health sciences between Cuba and the United States the Poisson Regression Analysis was used. Given that the independent variable is binary (included or excluded), and the dependent variable is the number of collaboratively published articles, this approach would be suitable for analyzing the relationship.

Poisson Regression models excel in the realm of modeling events characterized by count outcomes. More precisely, they are ideally suited for handling count data, which consists of discrete values representing non-negative integers, thus capturing phenomena such as the annual count of collaboratively published papers in Health Sciences between the United States and Cuba in a given year. The Poisson regression model is formulated as follows:

$$\log(Collaboration) = \beta_0 + \beta_1 + Inclusion + \epsilon$$

Where, log is the natural logarithm function. β_0 is the intercept. β_1 is the coefficient of the independent variable (Cuba's inclusion in the list of countries sponsors of terrorism), ε is the error term. When interpreting the results, if the coefficient β_1 is significantly different from zero and positive, it indicates that Cuba's inclusion in the terrorism list is associated with an increase in the number of collaboratively published articles in a year. Conversely, if the coefficient is significantly different from zero and negative, it suggests a decrease in collaboration due to inclusion in the list.

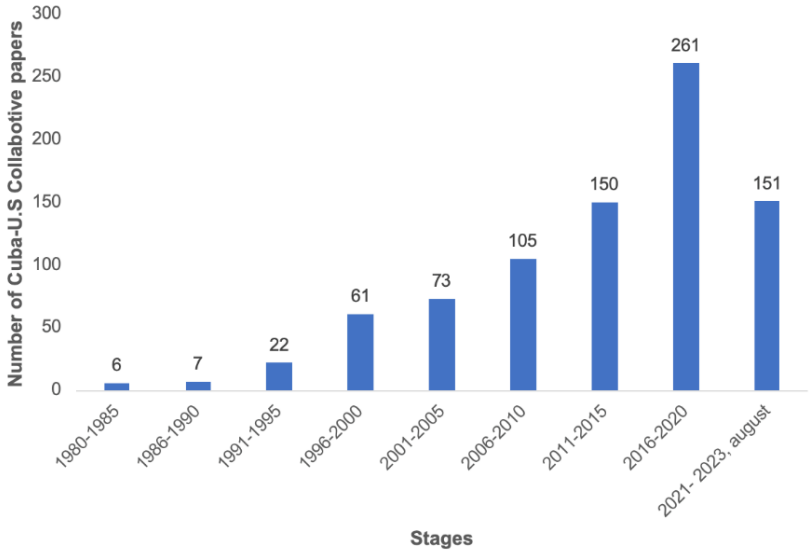
RESULTS AND DISCUSSION

Cuba published 2,245 articles (including articles, review articles, notes, letters, and proceeding papers) in collaboration with scientists from the United States between 1981 and 2023. Out of these, 837 (37%) were publications in health sciences.

Descriptive analysis

The Figure 1 provides collaboration data, spanning different periods, sheds light on the trends in Cuba-US health sciences collaboration, especially during periods of Cuba's inclusion on the terrorism list.

Figure 1. Cuba-US Health Sciences Collaboration by Field: Trends Across Terrorism List Inclusion Phases.



Source: based in data retrieved in WoS.

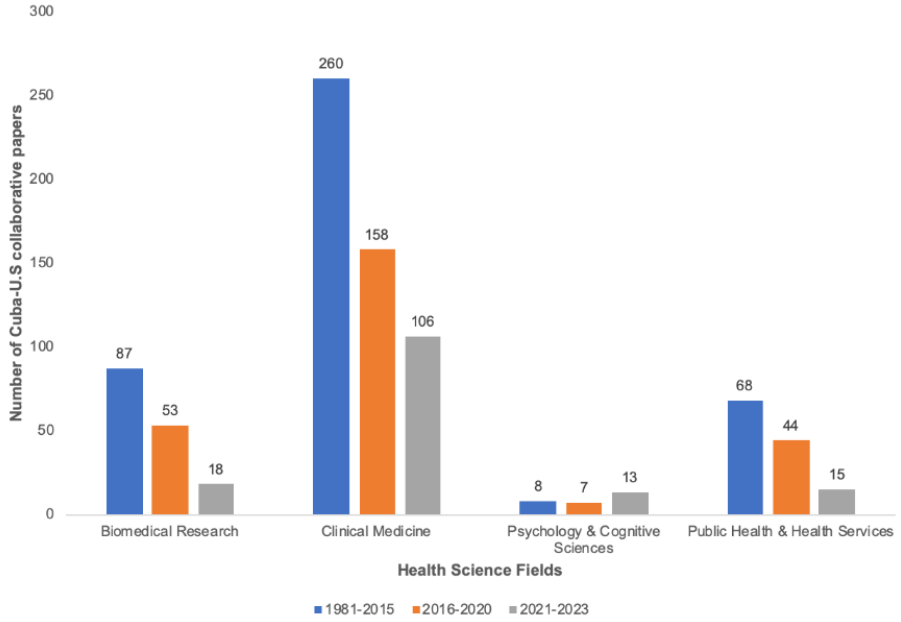
1981-2015: Inclusion on Terrorism List During this era, with Cuba being classified as a state sponsor of terrorism, collaboration in health sciences remained limited but progressively grew. The initial period (1980-1985) marked the start with a modest collaboration of 6. Over the next two decades, the collaboration increased significantly, as seen in the rising numbers: 7 (1986-1990), 22 (1991-1995), 61 (1996-2000), 73 (2001-2005), 105 (2006-2010), and culminating at 150 (2011-2015). This positive trajectory might be attributed to either improving relations. The early 1980s marked the nascent stages of a collaborative endeavor that would shape the trajectory of U.S.-Cuba relations. This transformative phase took root through a seminal agreement between the esteemed U.S. Smithsonian Institution and Cuba's revered Academy of Sciences (CAS). Subsequently, the 1990s witnessed the unfolding of another landmark collaboration, as the New York Botanical Garden aligned forces with CAS, further amplifying the scope of cooperative pursuits (Pastrana, 2015; Pastrana & Clegg, 2008). Against this backdrop, a pivotal juncture emerged in 1999 when the Clinton administration unveiled a visionary policy paradigm aimed at fostering people-to-people interactions. This far-reaching policy sought to transcend barriers, facilitating manifold exchanges—scientific dialogues notably among them—between the United States and Cuba. Within this policy framework, a general license was introduced, spanning specific categories such as diplomats, journalists, and academics. This pivotal concession illuminated a pathway through which U.S. university scientists could journey to Cuba, poised to engage in scholarly pursuits during their sojourns, with the explicit intention of generating consequential scientific publications.

It is imperative to underscore that the existence and scope of this overarching license might not have permeated universal awareness (DeWeerdt, 2001; S. Pastrana et al., 2018). Furthermore, traversing the procedural labyrinth to secure a visa for Cuban visitation entails arduous and protracted efforts (Abreu et al., 2017). This complex tapestry, woven with intricacies, reinforces the importance of understanding both the facilitative mechanisms and the tangible challenges underpinning the collaborative journey between these nations.

2016-2020: Exclusion from Terrorism List Cuba's exclusion from the terrorism list during this period seems to have facilitated a remarkable upsurge in health sciences collaboration with the United States. The collaboration numbers surged to 261 (2016-2020), a substantial increase from the previous period. This suggests that the absence of terrorism-related constraints facilitated a more open environment for scientific engagement. President Barack Obama's approach to normalizing the U.S. Cuba relations in 2015 enhanced Cuban scientific production with U.S. scientists by exceeding the number of collaborative papers published during any preceding U.S. Presidential administration. By 2020, Cuba had expanded its scientific links to 80% of the countries in the world.

Figure 2 illustrates the trends in scientific collaboration between Cuba and the United States across the three observed stages. The findings underscore that during the 5-year period (2016 – 2020) when Cuba was excluded from the list of state sponsors of terrorism, scientific collaboration with the United States witnessed a significant 39% surge in the fields of Biomedical Research and Clinical Medicine, as well as a noteworthy 35% increase in Public Health & Health Services.

Figure 2. Collaboration Trends in Health Sciences Between Cuba and the United States: Impact of Cuba's Terrorism List Inclusion.



Source: Own elaboration based in data retrieved in WoS, considering Science Citation Index Expanded, Social Sciences Citation Index, and Arts & Humanities Citation Index. Health Science fields classification according to Science Metrix journal classification list, available in: https://www.science-metrix.com/classification/.

These observations provide an insight into the nuanced dynamics of scientific collaboration between Cuba and the United States, particularly in the context of Cuba's inclusion/exclusion from the terrorism list. The data can be further analyzed to uncover specific trends and potential influencing factors within each subfield over time.

2021-2023: Re-Inclusion on Terrorism List The subsequent re-inclusion of Cuba on the terrorism list in 2021 did not immediately halt the collaboration momentum. While the collaboration numbers dropped slightly to 151, they still remained relatively high compared to the years when Cuba was previously included on the terrorism list. This might indicate that ongoing collaborations, established during the period of exclusion, persisted despite the renewed political constraints.

The data analysis reveals a nuanced interplay between Cuba's inclusion on the terrorism list and its health sciences collaboration with the United States. While being on the terrorism list appeared to hinder the extent of collaboration, it did not entirely suppress it. Furthermore, the periods of exclusion resulted in increased collaboration, suggesting that political factors can substantially influence scientific engagement.

These significant steps toward normalization of Cuba–U.S. relations by the Obama administration were reversed in 2017 when Donald Trump's administration revised U.S. policies toward Cuba (available at https://home.treasury.gov/policy-issues/financial-sanctions/sanctions-programs-and-country-information/cuba-sanctions). These latter changes dissuaded both sides from pursuing joint research, restricting scientific collaboration (S. J. Pastrana et al., 2018).

The results underscore the resilience of scientific collaboration in the face of political challenges, indicating that while geopolitical considerations do impact collaboration, the pursuit of scientific advancement often transcends these boundaries (Abreu et al., 2017; Anthes et al., 2015; Heger, 2016; Hogue, 2016; Pastrana & Clegg, 2008). Policymakers should consider these findings when assessing the potential consequences of including or excluding countries on terrorism lists, as such decisions can significantly affect the international scientific community and its contributions to global knowledge and well-being (Abreu et al., 2017; Anthes et al., 2015).

Experiment

The Poisson regression model was employed to examine the impact of the binary variable "Inclusion" (Cuba's inclusion in the terrorism list) on the count of collaborative articles ("Collaboration"). The analysis evaluates how the probability distribution of the count of articles changes with the inclusion status. The results of the Poisson regression analysis provide valuable insights into the relationship between Cuba's inclusion in the terrorism list and collaboration in the field of health sciences between Cuba and the United States.

In light of the discerned overdispersion within the outcomes of the Poisson regression model ($z = 1.675$, p-value = 0.047), our approach encompassed a thorough analysis involving the utilization of both the Quasi Poisson regression model and the Negative Binomial model, in alignment with recommendations from the existing literature. The Quasi Poisson regression model, recognized for its robustness in addressing overdispersion, was employed with due consideration. The ensuing examination of parameter disparities amongst the Poisson, Quasi Poisson, and Negative Binomial regression models yields substantive insights, as illustrated in Table 2.

Across all models, the intercept term, symbolizing the baseline value, consistently converges around 3.955. Correspondingly, the coefficient associated with the predictor variable "Inclusion" approximates -1.1184.

Upon closer inspection of standard errors (SE), a conspicuous divergence manifests among the three models. Notably, the Negative Binomial model exhibits amplified standard errors for both the intercept and the coefficient associated with "Inclusion," when juxtaposed with the Poisson model. This disparity accentuates heightened uncertainty enveloping parameter estimations within the frameworks of both the Negative Binomial and Quasi Poisson models.

This analysis highlights the robust standing of the Poisson regression model as a preferable choice for modeling the dataset under study. The model's significantly attenuated standard errors underscore the augmented reliability of parameter estimates. Consequently, these findings accentuate the prowess of the Poisson regression model in presenting a more steadfast representation of the underlying dynamics embedded within the dataset.

Table 2. Comparison of Coefficients and Exponents Between Poisson, Quasi Poisson, and Negative Binomial Regression Models.

	Poisson model		*Quasi Poisson model*		*Neg Binomial*		*Exponent*
	coef	*SE*	*coef*	*SE*	*coef*	*SE*	
Intercept	3.955	0.061	3.955	0.243	3.955	0.405	52
Inclusion	-1.184	0.074	-1.184	0.293	-1.184	0.434	0.314

Source: based in the Poisson regression model

Table 3 presents the results of the Poisson regression analysis. The intercept β_0 represents the expected log count of collaborative articles when Cuba is excluded from the terrorism list ("Inclusion" = 0), holding other factors constant. It is highly significant ($p < 0.001$).

The coefficient for "Inclusion" β_1 indicates the change in the log count of articles associated with Cuba's inclusion in the list of countries sponsors of terrorism ("Inclusion" = 1), while other variables are constant. This coefficient is also highly significant ($p < 0.001$). Both the intercept and "Inclusion" coefficients are remarkably significant ($p < 0.001$), indicating that they exert a substantial influence on the collaborative article count.

Table 3. Regression Model Parameters: Estimates and Significance.

Parameters	**Estimate**	***SE***	**p-value**
β_0	3.955	0.061	< 0.001
β_1	-1.184	0.074	< 0.001

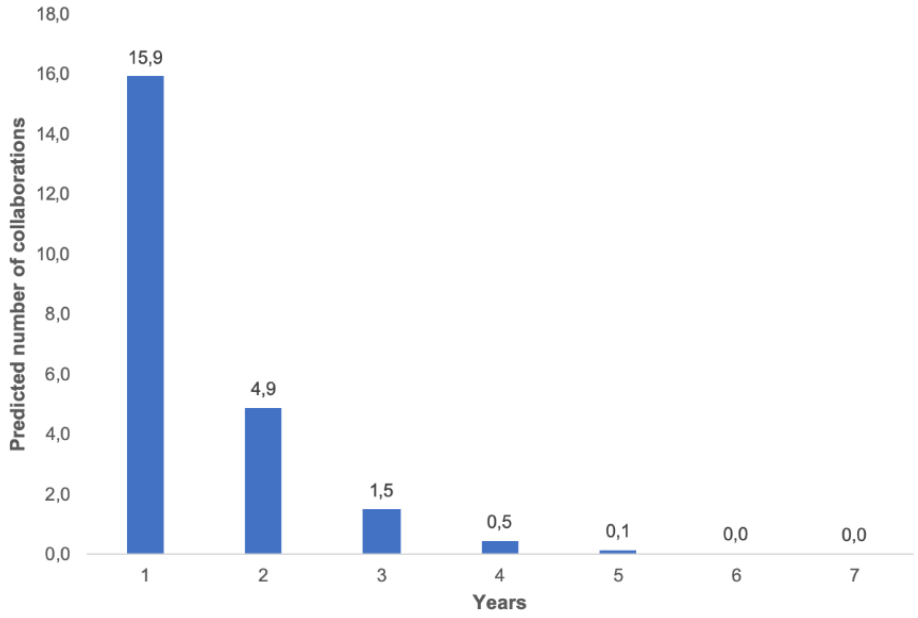
Source: based in the Poisson regression model.

$$y = e^{\beta_0 + \beta_1 * year} + \varepsilon$$

$$\log(Collaboration) = 3.955 - 1.184 * year$$

The Incidence rate ratio (*IRR*) $IRR = e^{\beta_1} = 2.718^{-1.184} = 0.306$. The IRR is interpreted as a multiplicative factor. The number of Cuba – US collaborative articles is expected to change by a multiplicative factor of 0.306 each year Cuba is included in the list. Since $1 - 0.306 = 0.694$, the Cuba – U.S collaboration in Health Sciences is reduced by 69% when Cuba is included in the list. The results suggest that even the Cuban–U.S. collaboration networks have been resilient to restrictive policies as suggested by Canete and Goodman (2015); DeWeerdt (2001), all the sustained scientific effort to maintain the cooperation to increase the development of research in joint and the mutually beneficial scientific interests highlighted in previous studies as in Abreu et al. (2017); Anthes et al. (2015); Heger (2016); Hogue (2016); Pastrana and Clegg (2008) would be vanished if scientific policymakers from both nations do not play a pivotal role to maintain and even encourage the implementation of particular strategies to renew the general license (www.treasury.gov/resource-center/sanctions/Programs/pages/cuba.aspx) which includes academics, allows U.S. university scientists, to travel to Cuban scientific institutions, if they work on academic pursuits during the visit, with the intention to produce scientific publications. The results in Figure 3 suggests that approximately in seven years the Cuba – Us in Health Sciences would be reduced next to none. The implementation of the abovementioned strategies would avoid the collapse of a bilateral scientific collaboration with more than a century of existence.

Figure 3. Prediction of the effects of the inclusion in the list. Assuming the year 0 is 52. $e^{\beta_0} = 2.718^{3.955} = 52$, and the decrease rate per year $2.718^{-1.184}$.



Source: based on prediction using the parameters obtain from the Poisson regression model.

CONCLUSIONS

The study shed light on the intricate relationship between political decisions and scientific collaboration in the realm of Health Sciences, specifically focusing on Cuba-US collaboration. Our findings underscore the resilience and adaptability of scientific partnerships in the face of political challenges, demonstrating that the pursuit of global health advancement often transcends boundaries. Through a meticulous analysis of Cuba's inclusion in the terrorism list, we have revealed that political dynamics do influence collaborative efforts, but they do not deter them entirely.

The implications of this research resonate across multiple dimensions. Beyond its academic significance, our study sheds light on the practical implications for policymakers, diplomatic officials, and healthcare leaders. By highlighting the potential impact of political decisions on scientific collaboration, we provide valuable insights for navigating complexities and fostering an environment conducive to international scientific partnerships.

Furthermore, our findings reinforce the critical role of Health Communication in bridging gaps created by political tensions. We contribute to the understanding that despite geopolitical challenges, scientific collaboration remains a vital tool for addressing global health issues and sharing knowledge for the greater good. This manuscript not only advances the field of Health Communication but also holds the potential to influence policy decisions and international relations, shaping the future of collaborative efforts in health sciences.

In essence, our study underscores the delicate balance between politics and science and emphasizes the transformative power of effective communication in maintaining and revitalizing collaborations, even amid geopolitical discord.

Limitations of the study

The analysis is based on collaboration data in Health Sciences between Cuba and the United States gathered from the Web of Science. Other scientific fields or countries may have different collaboration patterns and merit further analysis.

Possible future lines of research

In-depth qualitative analysis: Conducting a qualitative study to gain a more detailed understanding of the perceptions and challenges experienced by researchers and healthcare professionals involved in scientific collaboration between both countries. This could provide additional insights into how political decisions impact scientific collaboration.

Comparison with other countries: Expanding the study to include more countries and comparing the patterns of scientific collaboration in Health Sciences with Cuba and the United States with partnerships between other nations in similar or different political contexts.

Evaluation of diplomatic interventions: Investigating how specific diplomatic interventions, such as Cuba's temporary removal from the terrorism list, affect the dynamics of scientific collaboration. This could help identify strategies to foster and maintain scientific cooperation in challenging political situations.

Analysis of collaboration quality: Assessing not only the quantity but also the quality of scientific collaborations between Cuba and the United States. This would include evaluating the relevance of joint research, the impact of publications, and the transfer of knowledge between the countries.

By considering these limitations and possible future lines of research, we can enhance the understanding of the complex interplay between international politics and scientific collaboration in the field of Health Sciences. This will enable informed decision-making to strengthen and promote research and advancements in global health.

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