Epidemiologic trends of Multiple Sclerosis in Puerto Rico (2013-2020)

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Short Title: Epidemiologic trends of MS in Puerto Rico:

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Highlights
- Small upward trend on Multiple Sclerosis incidence in Puerto Rico over 8 years
- The COVID-19 pandemic seems to have an impact on Multiple Sclerosis incidence
- A mandatory Multiple Sclerosis registry allows for tracking incidence trends
- Standardized rates allow for appropriate international comparisons

Abstract
**Background:** Previous studies have demonstrated higher MS incidence and prevalence in PR than in other Caribbean and Latin American countries. Our objectives are to update the epidemiologic trends in MS incidence and prevalence rates for Puerto Rico (PR) from 2017 through 2020 and compare them to prior rate data from 2013 to 2016.

**Methods:** We used the Puerto Rico MS Foundation’s registry (PRMS Registry) data to identify all newly diagnosed MS cases between January 2017 and December 2020. The study population included 568 MS patients, 406 women, and 162 men living in PR. All individuals were 18 years and older and met the 2017 revised McDonald criteria for MS diagnosis. In addition, age- and sex-standardized incidence rates were estimated.

**Results:** In terms of results, 568 new MS cases were diagnosed in Puerto Rico between 2017 and 2020. The 2020 MS cumulative prevalence for Puerto Rico was 95.3/100,000 (95% CI 91.6, 99.1), higher than previously reported. The age- and sex-standardized MS incidence rate for Puerto Rico decreased from 6.5/100,000 (2017) to 6.3/100,000 (2020). The annual age-standardized MS incidence rates declined for females: from 9.5/100,000 (2017) to 8.2/100,000 (2020) but increased for males from 3.6/100,000 to 4.6/100,000 during the same period.

**Conclusion:** These incidence and prevalence rates are among the highest reported among Caribbean and Latin American countries. A peak in the age- and sex-standardized MS incidence rate was observed after hurricane María (2018) and a decline during the first year of the COVID-19 pandemic (2020). Further investigation is needed to determine whether there was a causal relationship between the fluctuations observed and those natural events.

**Keywords:** epidemiology, multiple sclerosis, incidence, prevalence, Puerto Rico, Caribbean, Hispanic/Latino
1. Introduction

Multiple Sclerosis (MS) has become the most common cause of neurological disability in young adults (Kock-Henriksen and Sorensen, 2010). Globally, the estimated number of persons living with MS increased to 2.8 million in 2020. This number has increased by 30% since 2013, making the worldwide prevalence of MS 35.9 per 100,000 people (Walton et al., 2020). However, comparisons across countries and specific time periods are difficult due in part to the lack of a uniform collection method (Walton et al., 2020). In addition, studies estimating MS prevalence and incidence rates over-represent higher-income countries with the resources to implement reliable data collection methods and standardized approaches (Walton et al., 2020).

MS incidence and prevalence rates have also increased gradually in Puerto Rico from 2013 to 2016, consistent with the global trend of MS increase (Chinea et al., 2017a). In contrast, Puerto Rico has the highest prevalence of MS when compared to other countries in Latin America (Cristiano and Rojas, 2017). Hispanics living with MS are a genetically admixed population where both genetic and environmental factors may influence the prevalence and incidence of MS. For example, a study presented at the 2020 meeting of the American Society for Human Genetics found that the ancestry composition for the PR population consists of a combination of indigenous Caribbean, African, and European groups with 14%, 15%, and 72%, respectively (Manrique et al., 2020). Puerto Rico has a higher incidence rate in Latin America and the Caribbean (LAC), but the mechanisms underlying this trend have not been fully elucidated (Chinea et al., 2017a).

Natural disasters and epidemics/pandemics have been reported to affect incidence and prevalence trends in chronic conditions and pose major public health challenges (Beaglehole et al., 2018; Ghazanchaei et al., 2021). For example, hurricane María, a category four hurricane,
struck Puerto Rico on September 20, 2017 bringing down most of the essential infrastructure of the island, including health care access (https://www.nhc.noaa.gov/archive/2017/MARIA.shtml?, https://www.fema.gov/press-release/20210318/hurricane-maria-update-0, https://www.theatlantic.com/politics/archive/2017/10/puerto-ricos-health-care-crisis-is-just-beginning/544210/). As a result, significant challenges and barriers for seeking and receiving health care and essential social services such as water and electrical power were encountered. Consequently, a net total of 215,166 people migrated to the United States (US), leading to a rapid population decline from 3,163,667 to 3,030,596 over the following year (US Census, 2021). Similarly, the COVID-19 pandemic, with the first cases in PR reported in early March of 2020, also has the potential of exacerbating trends in mortality and morbidity. For example, the mandatory lockdown order lasted for more than a year until April 2021. These mandates, although necessary, created a significant barrier to access healthcare, especially for individuals with chronic diseases. Whether these natural events might be associated with the incidence and prevalence of MS in PR is unknown.

Despite these challenges and taking advantage of the availability of a mandatory population-based registry for MS, this paper aims to update sex- and age-adjusted prevalence and incidence rates for MS in Puerto Rico from 2017 to 2020. We will also compare these estimates to prior epidemiological data from 2013 to 2016. This consecutive 8-year period is one of the largest in the medical literature of MS and allows us to assess MS fluctuations over a long period of time.

2. **Materials and Methods**

2.1 **Data Source**
The Puerto Rico MS Foundation registry is a population-based registry that was established in 2000, and it has been identifying MS cases using the 2001 McDonald criteria and updated to the 2017 revised McDonald criteria. Required by law since 2016 (Law 85 of 2016), the registry captures data from MS Centers, general neurologists, Specialty pharmacies, MRI centers, and health insurance companies. Furthermore, all the MS cases have to be certified by the treating Neurologist.

2.2 Population

Participants carry a diagnosis of MS, are 18 years and older, of Puerto Rican origin, and residing in Puerto Rico for at least two years prior to diagnosis. Informed consent was approved by the San Juan Bautista Medical School Institutional Review Board. All MS patients included in the registry must review and sign the informed consent form prior to the interview. The final study sample consisted of 568 newly diagnosed MS cases in Puerto Rico from 2017 to 2020.

2.3 Assessments

A neurologist using the 2017 revised McDonald criteria (Thompson et al., 2017) confirmed the diagnosis for all MS patients. Moreover, a standardized two-part questionnaire was developed and used in face-to-face and telephone interviews with newly diagnosed MS patients; details are described elsewhere (Chinea et al., 2017b). Briefly, the questionnaire had a section (part 1) for demographic data, medical history, and MS family history and another section (part 2) to confirm the MS diagnostic criteria.

2.4 Incidence of multiple sclerosis

Only newly diagnosed MS cases during calendar years 2017-2020 using the 2017 revised McDonald criteria were included as the numerator in calculating yearly incidence rates. The
diagnosing Neurologist confirmed the date of MS. The at-risk population (i.e., denominator) used to calculate incidence rates was the estimated annual Puerto Rico population 18 years of age and older for 2017-2020 obtained from the US Census population (US Census, 2021). Beginning in 2018, we removed from the denominator MS cases diagnosed the previous year to improve the validity and accuracy of our incidence estimates. Additionally, a comparison of MS Standardized Incidence Estimates before and after Hurricane María was done.

2.5 Prevalence of multiple sclerosis

Cumulative prevalence estimates were calculated using data from the Puerto Rico MS registry. All registry cases were included as the numerator in calculating age- and sex-specific 2020 cumulative prevalence rates. Therefore, the at-risk population (i.e., denominator) used to calculate cumulative prevalence rates was the estimated Puerto Rico population 18 years of age and older for 2020 obtained from the US Census population (US Census, 2021). In addition, the Puerto Rico Death Registry provided information on the number of MS patients that have died. Therefore, we removed these deaths from the numerator to further improve the precision of our prevalence estimates.

2.6 Statistical analysis

Frequency distributions, means, standard deviations, and percentages were calculated to describe the study sample. Age-standardized MS incidence and prevalence rates for Puerto Rico for the years 2017-2020 and their corresponding 95% confidence intervals (CI) were computed for the total sample and separately by sex. Census population estimates for Puerto Rico for 2017-2020 were used to calculate crude annual MS incidence and age- and sex-specific cumulative prevalence rates (US Census, 2021). Direct age- and sex-standardized annual MS incidence rates
were conducted using the 2010 World population estimates to facilitate international comparisons (US Census, 2017). In addition, we provide age-standardized annual MS incidence rates separately for males and females. Stata version 11.2 was used to evaluate and analyze the data. A 0.05 threshold for Type I error was used to determine statistical significance.

3. Results

3.1 Prevalence:

A total of 568 new MS cases were diagnosed in Puerto Rico between 2017 and 2020. The average age of newly diagnosed MS cases was 37.9 (±11.5) years, with the majority being females (71.6%). There was no statistically significant difference (p>0.999) in the mean age of MS diagnosis between males (37.9±11.6) and females (37.9±11.5). Table 1 shows that the 2020 MS cumulative prevalence for Puerto Rico was 95.3/100,000 (95% CI 91.6, 99.1). For males, the cumulative prevalence for the same year was 51.9/100,000 (95% CI 47.9, 55.9) and 133.3/100,000 for females (95% CI 127.3, 139.4); for a female to male ratio of 2.6:1. The 2020 cumulative MS prevalence for the total population peaks at 35-44 years of age (197.9/100,000; 95% CI 183.7, 212.1). Similarly, cumulative MS prevalence rates peak at 35-44 for both males (115.4/100,000; 95% CI 99.7, 131.2) and females (271.5/100,000; 95% CI 248.7, 294.3). However, the largest female to male ratio (4.8:1) happens in the 65+ age category.

Table 1. Age- and sex-specific cumulative MS prevalence per 100,000 population in Puerto Rico (2020)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Total Prevalence</th>
<th>95% CIs</th>
<th>Males Prevalence</th>
<th>95% CIs</th>
<th>Females Prevalence</th>
<th>95% CIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24</td>
<td>59.1</td>
<td>50.4, 67.9</td>
<td>32.8</td>
<td>23.6, 42.0</td>
<td>86.3</td>
<td>71.2, 101.5</td>
</tr>
<tr>
<td>25-34</td>
<td>134.5</td>
<td>123.2, 145.7</td>
<td>73.8</td>
<td>62.0, 85.7</td>
<td>193.7</td>
<td>174.7, 212.6</td>
</tr>
<tr>
<td>35-44</td>
<td>197.9</td>
<td>183.7, 212.1</td>
<td>115.4</td>
<td>99.7, 131.2</td>
<td>271.5</td>
<td>248.7, 294.3</td>
</tr>
<tr>
<td>45-54</td>
<td>148.8</td>
<td>136.9, 160.6</td>
<td>75.6</td>
<td>63.3, 87.9</td>
<td>213.8</td>
<td>194.3, 233.3</td>
</tr>
<tr>
<td>55-64</td>
<td>72.9</td>
<td>64.8, 81.0</td>
<td>35.7</td>
<td>27.4, 44.1</td>
<td>104.2</td>
<td>91.1, 117.3</td>
</tr>
<tr>
<td>65+</td>
<td>14.5</td>
<td>11.7, 17.3</td>
<td>4.6</td>
<td>2.2, 7.1</td>
<td>22.1</td>
<td>17.4, 26.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>95.3</td>
<td>91.6, 99.1</td>
<td>51.9</td>
<td>47.9, 55.9</td>
<td>133.3</td>
<td>127.3, 139.4</td>
</tr>
</tbody>
</table>

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Table 2 shows unstandardized and standardized MS incidence rates for 2017-2020 for the total population and by sex. The unstandardized and standardized MS incidence rates for the total Puerto Rico population from 2017-2020 show a peak in 2018 before coming back down in 2020 to pre-2017 levels. It fluctuates from an unstandardized (crude) low in 2020 of 4.7/100,000 (95% C.I. 3.9, 5.6) to a peak of 6.3/100,000 (95% C.I. 5.3, 7.3) in 2018. Similarly, the age- and sex-standardized rate fluctuates from a low in 2020 of 6.3/100,000 (95% C.I. 5.2, 7.5) followed by a peak in 2018 of 8.0/100,000 (95% C.I. 6.8, 9.2).

Table 2. Crude and age- and sex-standardized incidence rates of MS per 100,000 population in Puerto Rico (2017-2020)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Crude (95% CI)</th>
<th>Total Standardized (95% CI)</th>
<th>Males Crude (95% CI)</th>
<th>Males Standardized (95% CI)</th>
<th>Females Crude (95% CI)</th>
<th>Females Standardized (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>5.3 (4.4, 6.1)</td>
<td>6.5 (5.4, 7.6)</td>
<td>3.1 (2.1, 4.1)</td>
<td>3.6 (2.4, 4.7)</td>
<td>7.2 (5.8, 8.5)</td>
<td>9.5 (7.6, 11.3)</td>
</tr>
<tr>
<td>2018</td>
<td>6.3 (5.3, 7.3)</td>
<td>8.0 (6.8, 9.2)</td>
<td>3.6 (2.5, 4.7)</td>
<td>4.7 (3.3, 6.1)</td>
<td>8.7 (7.1, 10.2)</td>
<td>11.3 (9.3, 13.3)</td>
</tr>
<tr>
<td>2019</td>
<td>5.3 (4.4, 6.2)</td>
<td>6.9 (5.8, 8.1)</td>
<td>2.9 (1.9, 3.8)</td>
<td>3.8 (2.5, 5.0)</td>
<td>7.4 (6.0, 8.9)</td>
<td>10.1 (8.2, 12.1)</td>
</tr>
<tr>
<td>2020</td>
<td>4.7 (3.9, 5.6)</td>
<td>6.3 (5.2, 7.5)</td>
<td>3.5 (2.5, 6.6)</td>
<td>4.6 (3.2, 5.9)</td>
<td>5.8 (4.5, 7.1)</td>
<td>8.2 (6.4, 10.0)</td>
</tr>
</tbody>
</table>

For males, the crude annual MS incidence rates seem to fluctuate over time without a clear trend with a peak in 2018. The crude rate per 100,000 for males varies from 3.1/100,000 (95% C.I. 2.1, 4.1) in 2017 to 3.5/100,000 (2.5, 6.6) in 2020 with a peak of 3.6/100,000 (95% C.I. 2.5, 4.7) in 2018. In contrast, their age- and sex-standardized counterparts range from 3.6/100,000 (95% C.I. 2.5, 4.7) in 2018 to 8.0/100,000 (95% C.I. 6.8, 9.2) in 2020.
2.4, 4.7) in 2017 to 4.6/100,000 (95% C.I. 3.2, 5.9) in 2020 and a peak in 2018 of 4.7/100,000 (95% C.I. 3.3, 6.1). For females, a clear trend cannot be seen from 2017-2020 in both the crude and age-standardized rates with higher rates than males across all years and also with a peak in 2018. The crude rates went from 7.2/100,000 (95% C.I. 5.8, 8.5) in 2017 to a low of 5.8/100,000 (95% C.I. 4.5, 7.1) in 2020 and a peak in 2018 of 8.7/100,000 (95% C.I. 7.1, 10.2). Similarly, the age- and sex-standardized rates went from 9.5/100,000 (95% C.I. 7.6, 11.3) in 2017 to a low of 8.2/100,000 (6.4, 10.0) in 2020 and a peak of 11.3/100,000 (95% C.I. 9.3, 13.3) in 2018. The largest female to male ratio for both crude (2.6:1) and standardized (2.7:1) rates happened in 2019.

Table 3. Crude and age- and sex-standardized incidence rates of MS per 100,000 population in Puerto Rico (2013-2016)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Crude (95% CI)</th>
<th>Total Standardized (95% CI)</th>
<th>Males Crude (95% CI)</th>
<th>Males Standardized (95% CI)</th>
<th>Females Crude (95% CI)</th>
<th>Females Standardized (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>5.4 (4.5, 6.2)</td>
<td>6.1 (5.1, 7.1)</td>
<td>3.2 (2.3, 4.2)</td>
<td>3.7 (2.6, 4.8)</td>
<td>7.3 (5.9, 8.7)</td>
<td>8.4 (6.8, 10.0)</td>
</tr>
<tr>
<td>2014</td>
<td>5.2 (4.4, 6.1)</td>
<td>6.0 (5.0, 7.0)</td>
<td>3.0 (2.1, 4.0)</td>
<td>3.5 (2.4, 4.7)</td>
<td>7.3 (5.9, 8.7)</td>
<td>8.6 (7.0, 10.2)</td>
</tr>
<tr>
<td>2015</td>
<td>5.2 (4.3, 6.0)</td>
<td>6.5 (5.4, 7.5)</td>
<td>2.3 (1.4, 3.1)</td>
<td>2.9 (1.8, 4.0)</td>
<td>7.7 (6.3, 9.1)</td>
<td>10.0 (8.1, 11.8)</td>
</tr>
<tr>
<td>2016</td>
<td>5.5 (4.6, 6.4)</td>
<td>6.7 (5.7, 7.8)</td>
<td>3.1 (2.2, 4.1)</td>
<td>3.7 (2.5, 4.8)</td>
<td>7.6 (6.2, 9.0)</td>
<td>9.8 (8.0, 11.6)</td>
</tr>
</tbody>
</table>

3.2 Incidence:

From 2013-2016 age- and sex-standardized MS incidence rates for the total Puerto Rico population fluctuated between 6.0/100,000 and 6.7/100,000 (see Table 3) (3). In contrast, for 2018 (the year after Hurricane María), the estimated age- and the sex-adjusted incidence increased to
8.0/100,000. A similar trend was also observed by sex, but markedly higher for females (see Table 3) (3). The age-standardized MS incidence fluctuated between 2.9/100,000 and 3.7/100,000 for males for 2013-2016. In 2018, this same estimate for males was 4.7/100,000. For females, between 2013-2016, the age-adjusted MS incidence varied from 8.4/100,000 to 10.0/100,000, while in 2018, the estimate was 11.3/100,000. During the COVID-19 pandemic (2020), age- and sex-standardized incidence rates decreased to lower incidence levels (6.3/100,000) (Figure 1).

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**Hurricane Maria; ** Covid 19 Pandemic

Bar graph depicting the trends in MS incidence rates from 2013-2020. The years 2017 and 2020 are highlighted to reference these unprecedented events (Hurricane Maria and Covid 19 pandemic, respectively). The 2017 incidence rate decreases compared to 2016, and the same trend is seen with the incidence rate in 2020 (which also decreases compared to 2019).

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INSERT FIGURE 1 ABOUT HERE

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4. Discussion

Estimated age- and sex-standardized rates compared to prior years allowed us to assess fluctuations over time and identify departures from possible trends immediately following Hurricane María and during the COVID-19 pandemic. Overall, we found the age- and sex-standardized MS incidence rates between 2017-2020 are similar to our previously reported study from 2013-2016 (Chinea et al., 2017a). However, there was a marked peak in total and age- and sex-standardized MS incidence rates in 2018, one year after Hurricane María. Our study also provides 2020 cumulative prevalence estimates for MS for the entire population of Puerto Rico using data from the mandatory MS registry. The estimated 2020 cumulative prevalence of MS in Puerto Rico continues to rise and is the highest among countries in the Caribbean and Latin America (Chinea et al., 2017, Cristiano and Rojas, 2017). Although the reason is still unknown, this has been previously well-documented in the literature (Chinea et al., 2017a).

No epidemiologic studies have assessed the relationship between natural disasters (i.e., hurricanes, earthquakes) and possible fluctuations in MS incidence rates. In 2017, Hurricane Maria devastated Puerto Rico and left the island without power and access to essential resources for a significant period. This event posed challenges such as access to healthcare, food, water, and communication barriers for the general population and people suffering from chronic conditions like MS. Morbidity and mortality associated with a decline in the clinical care and management of chronic diseases is a frequently overlooked health outcome following natural disasters (https://www.nhc.noaa.gov/archive/2017/MARIA.shtml?, Hasan et al., 2020). However, the possible effects of Hurricane Maria on the Puerto Rican MS population have not been examined.
The rapid decrease in population may have led to a relative but temporary increase in incidence during this time. Over 70,000 people 18 years of age and older (out of a total population of 3.2 million) left the island in 2018 (US Census, 2021). However, it is unlikely that this emigration is the sole contributor.

Our results tend to indicate that incidence rates of MS in the Puerto Rican population during the COVID-19 pandemic in 2020 have decreased, trending toward pre-Hurricane Maria rates (as illustrated in Figure 1). To better understand this trend, it is crucial to recognize the social and cultural landscape of Puerto Rico during this time. In March 2020, Puerto Rico reported their first cases of COVID-19. The response by the Puerto Rican government was regarded as one of the most substantial of any US state or territory. The mandatory lockdown order lasted for more than a year until April 2021. This mandate, although necessary, created a significant barrier to access healthcare, especially for individuals with chronic diseases. When compared to Italy, which imposed a similar lockdown mandate from March 9 to May 4, 2020, MS patients reported widespread disruptions to their health care services (Manacorda et al., 2021). Germany, another country that also implemented a mandatory lockdown, also reported disruptions of health care services for MS patients (Richter et al., 2021). Results from a published abstract presented at the 2021 ECTRIMS conference found that one year after the pandemic patients in a Spanish tertiary hospital did not report changes in their mental health (i.e., depression or anxiety) but their physical and cognitive status worsened (Bello et al., 2021). A possible explanation for the downturn in the incidence of MS in PR during the COVID-19 pandemic could be due to healthcare barriers and delays in diagnosis and treatment associated with the lockdown mandate. In addition, the population's changing behaviors, including the unintended consequence of social distancing (i.e., the avoidance of health care facilities by
persons with MS for fear of infection), could have also impacted these trends in a downward direction.

Some of the study limitations must be mentioned. The source of patients represents the first limitation. Cases were identified from all licensed neurologists authorized to practice medicine in Puerto Rico reporting their MS patients to the PR MS Foundation registry. Nevertheless, even when required by law, there is a possibility of a reporting delay of MS cases, which would not have been included in our analysis. However, we are reasonably confident that this delay in reporting was present among a small percentage of neurologists. The second limitation is a diagnostic delay, a common problem with MS incidence studies due to the inevitable time lag between symptom onset and diagnosis of the disease. Therefore, the estimated 2020 incidence might be slightly underestimated by late reporting or diagnostic delays towards the end of the year. The third limitation is in the interpretation of the data by year. Specifically, it would have been helpful in this study to analyze the incidence rates of MS in Puerto Rico on a month-by-month basis following Hurricane Maria in September 2017 to better define the temporal relationship between the storm and the peak in data in 2018. Notwithstanding these limitations, our study also has several strengths. For example, we determined annual new MS cases all over the island using a population-based registry. Thus, our incidence estimates over three years represent the entire geographic landscape of PR. Another strength is using age- and sex-adjusted incidence estimates using a world standard population suggested by Zivadinov et al. (2003). This standardization allows for appropriate comparisons of incidence rates across countries and periods. Finally, our focus on incidence for three years that includes the year of the disaster and two years after it, overcomes a significant limitation on evaluating the impact of such an event on prevalence and incidence estimates of MS. The
availability of a registry for MS patients emphasizes the importance of having this type of resource that allows rapid and reliable data collection before and after any unprecedented event. This tool helps evaluate the impact of such unexpected events on population health measurements such as the incidence and prevalence of specific conditions.

5. Conclusion

MS incidence and prevalence estimates in Puerto Rico appear to have been affected by the aftermath of Hurricane Maria but then returned to expected trends within two years after the disaster. These estimates appear sensitive to natural disaster events that could reflect changes in access to care, migratory and displacement patterns, and morbidity and mortality in the aftermath. Therefore, it is important to highlight the importance of the Puerto Rico MS registry. This population-based and mandatory registry provides a solid foundation and unique opportunity for epidemiological research to shed new insights on the influence of random events such as disasters on incidence and prevalence estimates. Understanding variations in incidence and prevalence estimates after a disaster could help plan and allocate health care services in the aftermath of such an event. Therefore, there is a necessity for implementing multi-center registries that can provide researchers and clinicians access to validated and standardized patient data. Analysis of these data may allow for comparisons of population trends, the impact of biomarkers, genetic and environmental factors, and differing care patterns of treatment regimens of MS.

Currently, there is limited to no research quantifying the impact of natural disasters and a pandemic on prevalence and incidence estimates for specific chronic health conditions such as MS. A significant limitation for this lack of research is the absence of data, precisely, data
collected before and after unprecedented events like a natural disaster (i.e., hurricanes and earthquakes) or a global pandemic. Fortunately, MS is a mandatory registered-based chronic condition on the island. Therefore, it is possible to calculate yearly sex- and age-adjusted prevalence and incidence estimates for MS in Puerto Rico prior to Hurricane María (13) and before and during the COVID-19 pandemic. This data source allows us to overcome the significant limitation for estimating the prevalence and incidence of MS before, during, and after these unexpected and disruptive natural events and over long periods of time.

CRediT
Angel Chinea: Conceptualization, Writing – Review & Editing, Investigation, Supervision
Carlos F. Ríos-Bedoya: Conceptualization, Writing – Original draft preparation, Methodology, Validation, Data Curation, Formal Analysis
Ivonne Vicente: Conceptualization, Validation, Writing – Review & Editing, Supervision, Visualization
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Declarations of Interest

None

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