

Registres des Cancers général de la Manche, général du Calvados, digestif du Calvados et des hémopathies malignes de Basse-Normandie

## Melanoma trends in a Northeastern coastal state in Brazil

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Malignant Melanoma (MM) remains a highly aggressive form of cancer, with increasing incidence rates in both men and women in western regions. Countries such as New Zealand and Australia have reported the highest incidence and mortality rates due to changes in sun exposure behavior and the pursuit of tanning, as well as their fair-skinned populations exposed to cumulative UV radiation. Although mortality rates were rising in these regions until recently, they have now stabilized. The objective of our study is to present trends in MM incidence and mortality in a Northeastern coastal state in Brazil that has a high degree of miscegenation.

## **MATERIAL AND METHODS**

The State of Sergipe lies in the Northeast Region along the Atlantic coast of the country. It is the smallest state in Brazil by geographical area at 21,910 square kilometers (8,460 sq mi), larger only than the Federal District. According to the 2010 census, the population consisted of 1,062,975 females and 1,005,041 males, with 62% of skin types IV and V, 28% of types I-III, 9% of type VI, 1% of Asian individuals, and 0.3% of indigenous individuals, with 75% residing in urban areas and 25% in rural areas. We utilized the Aracaju Cancer Registry (ACR) database from 1996 to 2017 to compute agespecific and age-standardized rates for MM. For MM mortality, we used the Brazilian Mortality System's statelevel database from 1991 to 2021. We used the Joinpoint Regression Program to describe trends.



Fig 1. The state of Sergipe, Brazil, geographical localization

During the period of 1996-2017, the ACR detected 380 invasive melanoma and 31 melanoma in situ incident cases in men, and 443 invasive melanoma and 55 melanoma in situ incident cases in women (Table 1). The mean age-standardized incidence rates were 30.0 (95% CI: 27.0; 33.0) per million in men and 18.8 (95% CI: 17.1; 20.5) per million in women. Mortality data from 1991 to 2021 revealed 137 cases in men and 107 cases in women. The mean age-standardized mortality rates were 5.2 (95% CI: 4.3; 6.1) per million in men and 3.2 (95% CI: 2.6; 3.8) per million in women (Table 2). In Table 3, data of incidence and mortality trends are depicted. Incidence trends for all age groups rose, with an Annual Percent Change (APC) of 5.1 (95% CI: 3.0; 7.2) in men, mainly due to increasing incidence in age groups from 45 years onwards (Fig 2A), while they remained stable in women (APC 0.3, 95% CI: -1.6; 2.3) for all age groups (Fig 2B). Mortality trends remained stable for all ages in both men (APC 1.2, 95% CI: -0.8; 3.2) (Fig 2C) and women (APC 0.7, 95% CI: -1.3; 2.7) (Fig2D).

Table 2. Number and percentage of incident cases of melanoma (1996-2017) and deaths (1991-2021) by age group.

| Age Group | Inc cases | %     | Rate  | (95% CI)       | Mor cases | %     | Rate | (95% CI)     |
|-----------|-----------|-------|-------|----------------|-----------|-------|------|--------------|
| Age Group | inc cases | 70    | Mate  | (5570 CI)      | WOI Cases | 70    | nate | (55/0 Cl)    |
| Males     |           |       |       |                | Males     |       |      |              |
| 0-19      | 7         | 1.8   | 0.8   | (0.2; 1.4)     | 1         | 0.7   | 0.1  | (-0.1; 0.3)  |
| 20-44     | 68        | 17.9  | 12.8  | (97; 15.8)     | 23        | 16.9  | 2.4  | (1.4; 3.3)   |
| 45-64     | 141       | 37.1  | 80.1  | (66.9; 93.3)   | 46        | 33.8  | 11.3 | (8.1; 14.6)  |
| ≥65       | 163       | 42.9  | 215.8 | (182.6; 248.9) | 65        | 47.8  | 39.5 | (29.9; 49.2) |
| All       | 380       | 100.0 | 30.0  | (27.0; 33.0)   | 136       | 100.0 | 5.2  | (4.3; 6.1)   |
| Unknown   | 1         | 0.3   | -     | -              | 1         | 0.7   | -    | -            |
| Females   |           |       |       |                | Females   |       |      |              |
| 0-19      | 6         | 1.4   | 0.7   | (0.1; 1.2)     | 1         | 0.9   | 0.1  | (-0.1; 0.2)  |
| 20-44     | 98        | 22.1  | 12.0  | (9.7; 14.4)    | 17        | 15.9  | 1.7  | (0.9; 2.5)   |
| 45-64     | 154       | 34.8  | 46.3  | (39.0; 53.7)   | 32        | 29.9  | 6.1  | (4.0; 8.3)   |
| ≥65       | 185       | 41.8  | 131.9 | (112.9; 150.9) | 57        | 53.3  | 28.0 | (20.8; 35.3) |
| All       | 443       | 100   | 18.8  | (17.1; 20.6)   | 107       | 100   | 3.2  | (2.6; 3.8)   |
| Unknown   | 0         | 0     | -     | -              | 0         | 0     | -    | -            |
|           |           |       |       |                |           |       |      |              |

Table 3. Joinpoint analyses of malignant melanoma incidence (1996-2017) and mortality (1991-2021) trends, state of Sergine, Brazil,

|           | Inc M     |      |             |         | Mor M     |      |             |       |
|-----------|-----------|------|-------------|---------|-----------|------|-------------|-------|
| Age Group | JP Seg    | APC  | (95% CI)    | р       | JP Seg    | APC  | (95% CI)    | р     |
| 0-19      | NF        | NF   | NF          | NF      | NF        | NF   | NF          | NF    |
| 20-44     | 1996-2017 | 1.4  | (-2.0; 5.0) | 0.390   | NF        | NF   | NF          | NF    |
| 45-64     | 1996-2017 | 5.0  | (2.0; 8.0)  | 0.002   | 1991-2021 | 0.2  | (-2.5; 3.1) | 0.863 |
| ≥65       | 1996-2006 | 11.8 | (5.1; 18.9) | 0.001   | 1991-2021 | 3.2  | (-1.0; 7.7) | 0,12  |
|           | 2006-2017 | 0.4  | (-3.3; 4.2) | 0.838   |           |      |             |       |
| All       | 1996-2017 | 5.1  | (3.0; 7.2)  | < 0.001 | 1991-2021 | 1.2  | (-0.8; 3.2) | 0.238 |
|           | Inc F     |      |             |         | Mor F     |      |             |       |
| Age Group | JP Seg    | APC  | (95% CI)    | р       | JP Seg    | APC  | (95% CI)    | р     |
| 0-19      | NF        | NF   | NF          | NF      | NF        | NF   | NF          | NF    |
| 20-44     | 1996-2017 | -1.2 | (-4.5; 2.1) | 0.450   | NF        | NF   | NF          | NF    |
| 45-64     | 1996-2017 | 0.5  | (-2.7; 3.8) | 0.748   | 1994-2021 | 0.3  | (-3.4; 4.1) | 0.868 |
| ≥65       | 1996-2006 | 1.1  | (-1.7; 4.0  | 0.412   | 1992-2021 | -0.8 | (-3.3; 1.7) | 0.498 |
| All       | 1996-2017 | 0.3  | (-1.6; 2.3  | 0.719   | 1992-2921 | 0.7  | (-1.3; 2.7) | 0.49  |

Inc M: Incidence in males; Inc F: incidence in females; Mor M: Mortality in males; Mor F: mortality in females; JP Seg: Time range segment; APC: Annual Percent change; CI: Confidence interval; NF: Model not fitted

Table 1. Number and percentage of incident cases of melanoma by site, in males and females, state of Sergipe, Brazil, 1996-2017.

| Site  | м   | %  | F   | %  |
|---|---|--|---|--|
| A   |   |  |   |  |
| Malignant melanoma of lip                                 | 3   | 0,7  | 4   | 0.8  |
| Malignant melanoma of eyelid, including canthus           | 4   | 1.0  | 4   | 0.8  |
| Malignant melanoma of ear and external auricular canal    | 4   | 1.0  | 1   | 0.2  |
| Malignant melanoma of other and unspecified parts of face | 27  | 6,6  | 41  | 8.2  |
| Malignant melanoma of scalp and neck                      | 16  | 3.9  | 10  | 2.0  |
| Malignant melanoma of trunk                               | 121   | 29.4   | 101   | 20.3   |
| Malignant melanoma of upper limb, including shoulder      | 40  | 9.7  | 61  | 12.2   |
| Malignant melanoma of lower limb, including hip           | 85  | 20.7   | 122   | 24.5   |
| Overlapping malignant melanoma of skin                    | 2   | 0.5  | 2   | 0.4  |
| Malignant melanoma of skin, unspecified                   | 55  | 13.4   | 68  | 13.7   |
| Total   | 357   | 86.9   | 414   | 83.1   |
| В   |   |  |   |  |
| Malignant melanoma of palate                              | 0   | 0  | 1   | 0.2  |
| Malignant melanoma of nasopharynx                         | 1   | 0.2  | 1   | 0.2  |
| Malignant melanoma of rectum                              | 0   | 0  | 2   | 0.4  |
| Malignant melanoma of nasal cavity                        | 1   | 0.2  | 2   | 0.4  |
| Cavidade Nasal  | -   | -  | 6   | 1.2  |
| Vulva   | -   | -  | 1   | 0.2  |
| Vagina  | -   | -  | 1   | 0.2  |
| Colo do Útero   | -   | -  | 1   | 0.2  |
| Malignant melanoma of eye and adnexa                      | 21  | 5.1  | 14  | 2.8  |
| Total   | 23  | 5.6  | 29  | 5.8  |
| c   |   |  |   |  |
| Melanoma in situ of lip                                   | 0   | 0  | 0   | 0  |
| Melanoma in situ of eyelid, including canthus             | 1   | 0.2  | 1   | 0.2  |
| Melanoma in situ of ear and external auricular canal      | 0   | 0  | 0   | 0  |
| Melanoma in situ of other and unspecified parts of face   | 6   | 1.5  | 11  | 2.2  |
| Melanoma in situ of scalp and neck                        | 4   | 1.0  | 3   | 0.6  |
| Melanoma in situ of trunk                                 | 10  | 2.4  | 9   | 1.8  |
| Melanoma in situ of upper limb, including shoulder        | 2   | 0.5  | 16  | 3.2  |
| Melanoma in situ of lower limb, including hip             | 2   | 0.5  | 8   | 1.6  |
| Melanoma in situ of other sites                           | 1   | 0.2  | 0   | 0  |
| Melanoma in situ, unspecified                             | 5   | 1.2  | 7   | 1.4  |
| Total   | 31  | 7.5  | 55  | 11.0   |
| Total A+B+C   | 411   | 100  | 498   | 100.0  |
|   | Site Maignant melanoma of ipp Maignant melanoma of eyelid, including canthus Maignant melanoma of ear and external auricular canal Maignant melanoma of other and unspecified parts of face Maignant melanoma of scalp and neck Maignant melanoma of upper limb, including shoulder Maignant melanoma of upper limb, including shoulder Maignant melanoma of skalp and neck Maignant melanoma of neckum Maignant melanoma of eye and adnexa Total Melanoma in situ of lip Melanoma in situ of skalp and neck Melanoma in situ of tapi and meck melanoma in situ of twalp and neck | Site         M           Aignant melanoma of ipp         3           Maignant melanoma of evelid, including canthus         4           Maignant melanoma of ear and external auricular canal         4           Maignant melanoma of ear and unspecified parts of face         72           Maignant melanoma of char and unspecified parts of face         72           Maignant melanoma of char and unspecified parts         16           Maignant melanoma of unit, including shoulder         40           Maignant melanoma of usin, unspecified         55           Total         357           Balgnant melanoma of apate         0           Maignant melanoma of apate         0           Maignant melanoma of restum         0           Maignant melanoma of explay         1           Cavidade Nasal         2           Vuha         -           Colo do Utero         -           Maignant melanoma of explay and meksa         21           Total         2           Maignant melanoma of apate         0           Maignant melanoma of explay and neck         10           Maignant melanoma of explay and neck         21           Cavidade Nasal         23           Cabl do Utero         - | Site         M         %           Alignant melanoma of lipi         0         7           Mailgnant melanoma of eyelid, including canthus         4         1.0           Mailgnant melanoma of ear and external auricular canal         4         1.0           Mailgnant melanoma of ear and unspecified parts of face         7.7         5.6           Mailgnant melanoma of orbar and unspecified parts of face         7.2         5.6           Mailgnant melanoma of scalp and neck         1.21         2.9.4           Mailgnant melanoma of scalp and neck         1.22         2.9.4           Mailgnant melanoma of skin         2.0         5.5           Overtapping malignart melanoma of skin         2.0         5.5           Mailgnant melanoma of postin         0.0         0           Mailgnant melanoma of necturn         0.0         0           Mailgnant mela | Site         M         %         F           Malignant melanoma of ippelid, including canthus         3         0.7         4           Malignant melanoma of eyelid, including canthus         4         1.0         1           Malignant melanoma of eyelid, including canthus         4         1.0         1           Malignant melanoma of ear and external auricular canal         4         1.0         1           Malignant melanoma of other and unspecified parts of face         7         6.6         41           Malignant melanoma of scalp and neck         16         3.9         10           Malignant melanoma of upper limb, including shoulder         40         9.7         6.1           Malignant melanoma of skin         2         0.5         2         1.34         6.8           Total         337         8.69         414         8         0         1         1         0.2         1           Malignant melanoma of nasal cavity         0         0         0         1         1         1         0.2         1           Malignant melanoma of nasal cavity         1         0         0         0         1         1           Malignant melanoma of negating anticular canal         1         0.2         1 |

ICD: International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10); M: Number of incident cases, males; F: Number of incident cases, females



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Fig 2. Trends of melanoma incidence in males (A) and females (B); trends of melanoma mortality in males (C) and females (B).