

# Letter to the Editor

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## Acculturation, Obesity, and Hypertension Among Female Brazilian Indians

To the Editor:

The Amazon is the largest native forest in the world. There, many isolated and relatively unacculturated Amerindian populations still strive to keep their cultures untouched. In a series of reports from 1989 to 1992, one of us (Carvalho) and colleagues of the Intersalt Study have evidenced that both obesity and hypertension were entirely absent among an uncivilized Amazon tribe named Yanomamo.<sup>1-5</sup> Moreover, blood pressure did not increase with age, and both salt and alcohol were unknown among this ethnic group.

Presently, there are ≈460 000 Indians in Brazil living in 225 villages and speaking 180 languages. They correspond to 0.26% of the Brazilian population and live in preserved areas that represent ≈15% of the country's territory.<sup>6</sup> Approximately 175 000 Brazilian Indians (35.7%) live in the Amazon. Very few Amazon tribes remain uninfluenced by Brazilian civilization. Moreover, there are no longer completely unacculturated ethnic groups outside the Amazon basin, although, by definition, these Indian tribes keep speaking primarily their original language.<sup>6</sup>

Here we report the main preliminary results of the project titled, "1° Inquérito Nacional de Saúde e Nutrição dos Povos Indígenas," the first-ever comprehensive health and socioeconomic evaluation of Brazilian Indians all over the country.<sup>7</sup> This is a collaborative project held by several Brazilian universities organized under the auspices of the Ministry of Health and the Associação Brasileira de Pós-Graduação em Saúde.<sup>7</sup> Here we describe the main preliminary findings of the project first report, published online in Portuguese only,<sup>7</sup> which may be of international relevance.

In the present study, 6707 Brazilian female Indians aged 15 to 49 years and living in 5277 households in 113 villages were aleatorily selected all over the country by regional pondered sampling. Data were collected between 2008 and 2009. Female Indians living in the Amazon area numbered 2574 (38.4%), whereas 4133 others were living in the 4 remaining regions of the country (Table).

For all indicators, acculturation was more evident in villages living away from the Amazon. As expected, children in the Amazon region were more likely to be stunted and to have anemia. In addition, Amazon adult females were also more likely to have anemia and to be pregnant than were non-Amazonian female Indians.

However, if acculturation seems to protect against anemia and stunting, it also increases by ≈3.3 and 3.8 times the odds for obesity and hypertension, respectively ( $P < 0.001$  for both). Interestingly, adult Indians living in the Amazon were no more likely to be underweight than those living in other regions, suggesting lack of food not being a problem there. In fact, only ≈2% of both regional groups presented a body mass index  $< 18.5 \text{ kg/m}^2$  (Table).

Obesity is possibly the most important risk factor for hypertension.<sup>8</sup> In the present study, virtually all of the hypertensive subjects were obese or at least overweight (data not shown). Acculturation seems to be taking place even in the furthestmost Amazon tribes. In fact, although our group have demonstrated the virtual absence of obesity and even overweight among the Yanomamo Indians (mean

**Table. Basic and Clinical Data Comparing Less Acculturated Brazilian Female Indians Living in the Amazon Region With Those Living in All Other Combined Regions of the Country**

| Data                                 | Amazon, n (%)   | Other Regions, n (%) | <i>P</i> * |
|--------------------------------------|-----------------|----------------------|------------|
| <b>Basic data</b>                    |                 |                      |            |
| No. of women (15 to 49 y)            | 2574            | 4133                 | ...        |
| No. of households                    | 1822            | 3455                 | ...        |
| <b>Age groups, y</b>                 |                 |                      |            |
| 14 to 19                             | 680 (26.4)      | 1024 (24.8)          | 0.4        |
| 20 to 19                             | 935 (36.3)      | 1605 (38.8)          | 0.5        |
| 30 to 39                             | 650 (25.3)      | 989 (23.9)           | 0.4        |
| 40 to 49                             | 309 (12.0)      | 515 (12.5)           | 0.6        |
| <b>Maternal and child data</b>       |                 |                      |            |
| Pregnant women, %                    | 317 (12.3)      | 327 (7.9)            | $< 0.001$  |
| Children aged from 6 to 59 mo        | 2342            | 3180                 | ...        |
| Stunted children, %                  | 963 (41.1)      | 739 (21.4)           | $< 0.001$  |
| Anemia in children, %                | 1546 (66.0)     | 1488 (46.8)          | $< 0.001$  |
| <b>Measurements of acculturation</b> |                 |                      |            |
| Fishing and/or hunting               | 1722 (93.9)     | 1693 (41.0)          | $< 0.001$  |
| Remunerated work                     | 773 (42.1)      | 2499 (60.5)          | $< 0.001$  |
| Forest extractivism                  | 741 (40.4)      | 221 (5.3)            | $< 0.001$  |
| Tap inside home                      | 82 (4.5)        | 926 (26.8)           | $< 0.001$  |
| Drink water from river               | 504 (27.5)      | 74 (2.1)             | $< 0.001$  |
| <b>Clinical data</b>                 |                 |                      |            |
| Weight data, %†                      | 2217 (86.1)     | 3704 (89.6)          | 0.3        |
| Underweight, %                       | 51 (2.3)        | 94 (2.5)             | 0.6        |
| Normal weight, %                     | 1479 (66.7)     | 1699 (45.9)          | $< 0.001$  |
| Overweight, %                        | 558 (25.2)      | 1172 (31.6)          | $< 0.001$  |
| Obesity, %                           | 135 (6.1)       | 739 (20.0)           | $< 0.001$  |
| <b>Blood pressure data</b>           |                 |                      |            |
| Hypertension, %‡                     | 67 (3.8)        | 463 (14.6)           | $< 0.001$  |
| <b>Anemia data, %§</b>               |                 |                      |            |
| Anemia in nonpregnant women, %       | 966/2059 (46.9) | 1041/3666 (28.4)     | $< 0.001$  |
| Anemia in pregnant women, %          | 142/317 (44.8)  | 102/327 (31.2)       | 0.02       |

Data are n (%) or n/N (%) unless otherwise specified.

\*Data are from a  $\chi^2$  test.

†Underweight = body mass index  $< 18.5 \text{ kg/m}^2$ ; normal weight,  $18.5 \leq$  body mass index  $< 25.0 \text{ kg/m}^2$ ; overweight,  $25.0 \leq$  body mass index  $< 30.0 \text{ kg/m}^2$ ; obesity, body mass index  $\geq 30 \text{ kg/m}^2$ .

‡Systolic blood pressure  $\geq 140 \text{ mm Hg}$  or diastolic blood pressure  $\geq 90 \text{ mm Hg}$ .

§According to the World Health Organization criteria for anemia in women: hemoglobin is  $< 12 \text{ g/dL}$  for nonpregnant women or  $< 11 \text{ g/dL}$  in pregnant women.

body mass index:  $21.1 \text{ kg/m}^2$ )  $>2$  decades ago,<sup>1</sup> presently as much as 31.3% of Amazon female Indians were found to be either obese or overweighted. Contemporary Brazil has much to learn with our original peoples who, unfortunately, are watching their own healthy lifestyle disappear as acculturation takes place.

We believe that these findings have important implications in understanding the cultural roots of obesity and hypertension, 2 related “diseases of civilization.”<sup>9</sup>

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### Disclosures

None.

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