



Contents lists available at SciVerse ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Comments on “Foster KR, Trottier L, Comments on “Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, ...,” Sci Total Environ (2012), doi: 10.1016/j.scitotenv.2012.06.007”

Keywords:

Neoplasia and cellular telephone base stations
Public health
Non-ionizing electromagnetic radiation
Biological effects of radiofrequency and microwaves on human health
Epidemiological studies
Electromagnetic fields

Concerning the critique made by K. R. Foster (Department of Bioengineering, University of Pennsylvania, Philadelphia, PA, 1094, USA) and L. Trottier (1055 ST Regis Blvd Dorval, QC H9P 2T4) of the article published in the journal, Science of the Total Environment, “Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil”, by A. C. Dode et al. (Science of the Total Environment 409 (211) 3649–3655), we offer the following comments (Dode et al., 2011).

We believe that the authors of the critique misinterpreted our paper. Concerning the types of cancer, the selection was based on a vast literature review of the possible biological effects of radiofrequency and microwaves on human health, including several recently published epidemiological studies, as shown in Table I, p. 3654 of our article. From a total count of 22,493 deceased during the observation period, we filtered out those which had positive exposure relative to the first Radio Base Station (RBS) installed near the death residences of the deceased in each Census Tract (CT).

We accomplished the geoprocessing of the deaths by neoplasia using the geographical coordinates of the corresponding residences, provided by the Municipal Health Secretariat, while the location of

the RBS's used the geographical coordinates furnished by ANATEL, our national telecommunications agency. We used the software MAPINFO™ plus the Kernel Method to estimate the least distance between the deceased and the RBS's, as is shown in Figs. 2 and 3 in this reply (Dode, 2010).

Almost every person is exposed to the electromagnetic fields emanating from some RBS's, due to the three-dimensional coverage of the mobile system.

The count of deaths and the number of dwellers in each radial range of 100 m, 200 m, 300 m, and so on, was done using MAPINFO™ and, obviously, there is some overlapping of the data. For example, someone living within 100 m of a certain RBS, probably also lives within 200 m, 300 m, and so on, of other RBS's in the neighborhood. In other words, the exposure is cumulative. This is reflected in the mortality rates estimated for the radial ranges around each RBS.

The exposure durations used in our paper were counted from the date of installation of the first RBS in the surroundings of each residence, for each radial range, and for each CT. However, we did not consider, as stated by the authors of the critique, the date of installation of the first RBS in the city of Belo Horizonte (Dode, 2010).

Table 5 of our paper represents the mortality rate with respect to the radial distance, from the first licensed RBS nearest to the residence of the deceased, in each CT, taking into account the population belonging to those CT's (IBGE, 2000, “Instituto Brasileiro de Geografia e Estatística” – Brazilian Institute of Geography and Statistics) (Dode et al., 2011). The denominator of our mortality rate – the CT population – was, therefore, overestimated, since we considered the whole population of each CT, although only partially covered in each radial range, as is shown in Fig. 4 in this report (Dode, 2010). The analysis was done taking into account the entire geographical area of the city, including all its 9 census tracts.

As reported in our paper, our methodology relied on the database of death occurrences by cancer, which types agree with the theoretical framework of Table 1, page 3654, as well as on the data pertaining to installation of the RBS, extracted from the register of ANATEL. All calculations were strictly based on the collected data, even with the understanding that those registers are sometimes incomplete. This

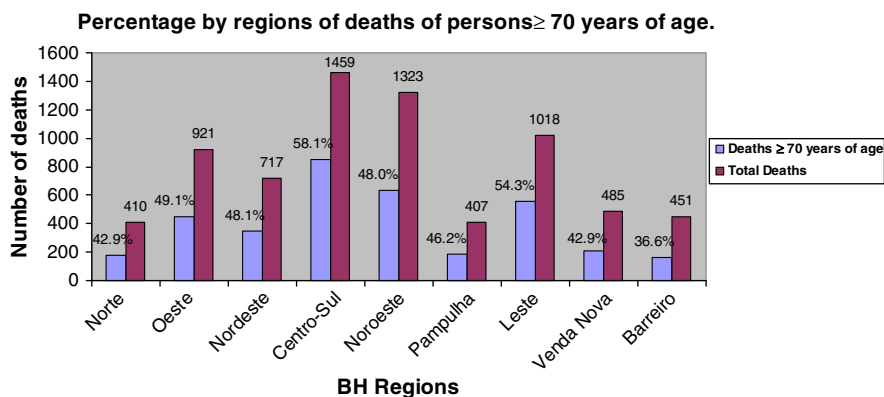


Fig. 1. Percentage by regions of deaths of persons ≥ 70 years of age.

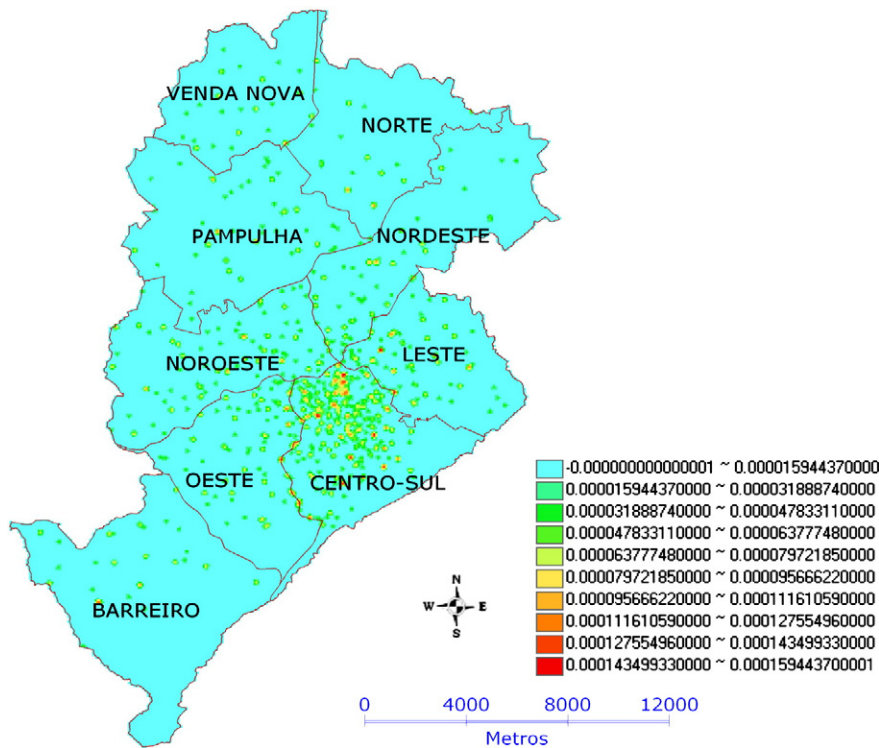


Fig. 2. Kernel Method – Antennas Base Stations – Belo Horizonte – 2006.

resulted in more conservative and underestimated outcomes. We also performed some measurements of radiation level or electric field intensity around some RBS's, as well as in some residences, as can be found in our paper.

The authors of the critique also stated that the antennas of mobile systems do not aim at buildings, and also that it is not correct to affirm that building dwellers are exposed to electromagnetic fields. However, it should be mentioned that antennas of sectorized RBS's have horizontal

radiation patterns whose angular widths fall around 60 to 70°, in order to attain good sectoral coverage. Thus subscribers included in that angular span will be exposed to a radiation level varying from maximum (0 dB) down to half power (−3 dB). Otherwise, it would be not possible to guarantee a signal, with the appropriate level, to subscribers inside houses and other buildings.

When we performed the measurements of exposure levels, it was quite common to find the highest in the buildings' upper stories

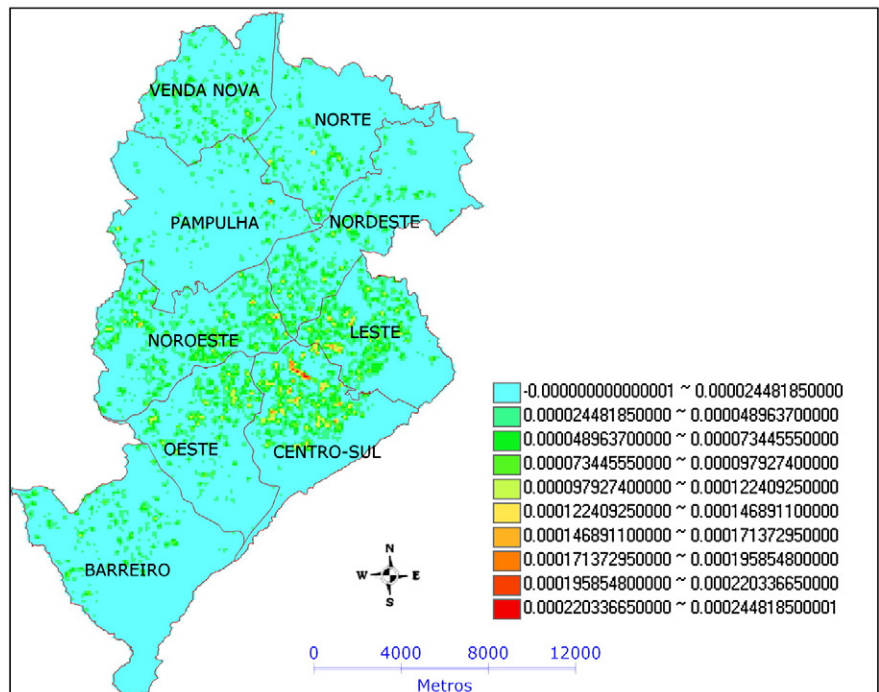


Fig. 3. Kernel Method containing the total deaths by neoplasia, in the municipality of Belo Horizonte, related to ICD coded (EMF) from 1996 to 2006. Total: 7191 deaths.

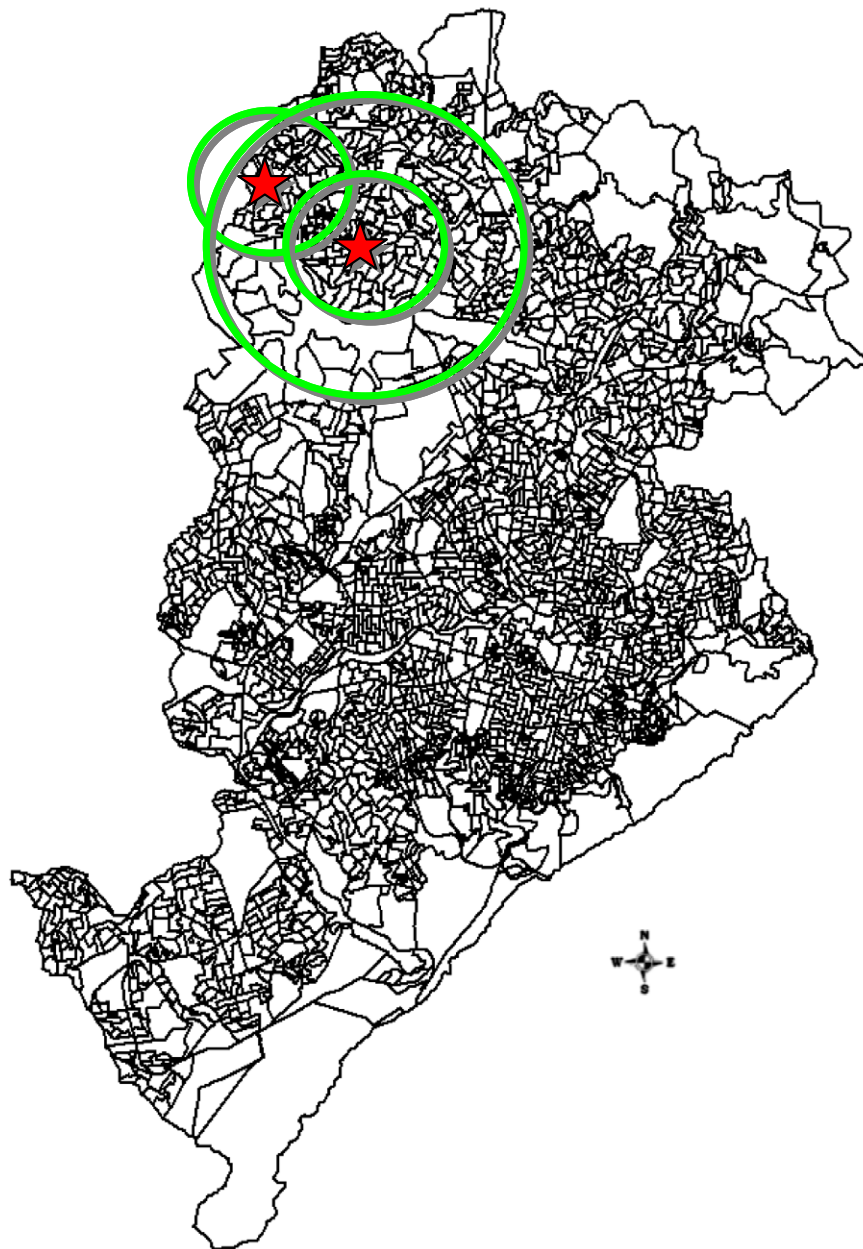


Fig. 4. Map containing census sectors.

whereas the intensities were substantially lower at ground level. Fig. 3 on page 3652 of our paper represents typical horizontal and vertical radiation patterns of the antennas pertaining to the RBS of site BH 20, localized at Rua do Ouro, number 1373 (Dode, 2003).

It is incorrect to suggest that there are more elderly residents in a radial range of 100 m than beyond a radial range of 200 m from each RBS, as do the authors of the critique. To clarify that issue, we included Table 1 as well as Fig. 1 in this reply, which show the percentages of deaths corresponding to subjects whose ages were greater than or equal to 70 years in all the 9 regions of the municipality (Dode, 2010).

Fig. 16 on page 3664 of the paper refers to the number of deceased versus exposure time, starting from the first antenna installed and in operation in the surroundings of their residences in each CT. The greatest number of deaths occurred during a period of up to 6 years of exposure. In 1998, there were some deaths, although we could not geoprocess them.

The authors of the critique refer to the WHO Fact Sheet conclusion in May 2006, on base stations and wireless technologies, according to

which “considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects”.

Table 1

Percentage by regions of deaths of persons ≥ 70 years of age.

Region	Deaths ≥ 70 years of age	Total deaths	Percentage
Norte	176	410	42.93%
Oeste	452	921	49.08%
Nordeste	345	717	48.12%
Centro-Sul	847	1459	58.05%
Noroeste	635	1323	48.00%
Pampulha	188	407	46.19%
Leste	553	1018	54.32%
Venda Nova	208	485	42.89%
Barreiro	165	451	36.59%
Total Deaths	3569	7191	49.63%

We suggest that the authors of this critique refer to the May 2011 IARC release, which “has classified radio-frequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer – 237,913 new cases of brain cancers (all types combined) occurred around the world in 2008 – associated with wireless phone use”. Working Group of 31 scientists from 14 countries meeting at IARC in Lyon, France.

These assessments will be published as Volume 102 of the IARC *Mono-graphs*, which will be the fifth volume in this series to focus on physical agents, after Volume 55 (Solar Radiation), Volume 75 and Volume 78 on ionizing radiation (X-rays, gamma-rays, neutrons, radio-nuclides), and Volume 80 on non-ionizing radiation (extremely low-frequency electromagnetic fields). IARC/WHO – Press Release no. 208, May 31st, 2011, Lyon, France: “IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans” Available on <http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208E.pdf> (IARC/WHO, 2012).

We shall continue our research in the municipality of Belo Horizonte, Minas Gerais state, Brazil, assessing and evaluating the levels of human exposures to the electromagnetic fields that emanate from RBS's, involving people with neoplasia, both in residences and in work places (Dode, 2011).

References

- Dode A.C. “Environmental pollution and human exposure to electromagnetic fields: a case study in Belo Horizonte municipality emphasizing mobile phone base stations” (Poluição ambiental e exposição humana a campos eletromagnéticos: estudo de casos no município de Belo Horizonte com ênfase nas estações radiobase de telefonia celular). Thesis: Master Degree in Sanitation, Environment and Hydric Resources - Engineering School, Federal University of Minas Gerais, Belo Horizonte City, Brazil (Dissertação: Mestrado em Saneamento, Meio Ambiente e Recursos Hídricos - Escola de Engenharia, Universidade Federal de Minas Gerais, Belo Horizonte). p175. 2003.
- Dode A.C. “Dirty electricity, cellular telephone base stations and neoplasia”, Volumes 412–413, 15 December 2011, Page 391, published in the journal “Science of Total Environment”. <http://dx.doi.org/10.1016/j.scitotenv.2011.09.022>, Elsevier, Netherlands / United States of America, December 2011.
- Dode A.C. “Mortality by neoplasia and the cellular telephony in Belo Horizonte municipality - Minas Gerais”. (Mortalidade por neoplasias e a telefonia celular no município de Belo Horizonte - Minas Gerais). Thesis: Doctorate Degree in Sanitation, Environment and Hydric Resources - Engineering School, Federal University of Minas Gerais, Belo Horizonte City, Brazil. (Dissertação de Doutorado em Saneamento, Meio Ambiente e Recursos Hídricos - Escola de Engenharia, Universidade Federal de Minas Gerais, Belo Horizonte). 244 pp. 2010. Available on: www.bibliotecadigital.ufmg.br/dspace/bitstream/1843/BUOS-8UCNEL
- Dode A.C., Leão M.M.D., Tejo F.A.F., Gomes C.R., Dode D.C., Dode M.C., et al., “Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil”, Volume 409, Issue 19, 1 September 2011, Pages 3649–3665, published in the journal “Science of Total Environment”, <http://dx.doi.org/10.1016/j.scitotenv.2011.05.051>, Elsevier, Netherlands/United States of America, September 2011.
- IARC/WHO: “IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS” - Press Release nº 208, Lyon, France, May 31st, 2011. Available on: http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf Belo Horizonte (MG), Brazil, September 30th, 2012.

Adilza Condessa Dode

*Municipal Government of Belo Horizonte, Municipal Health Department,
Belo Horizonte City, Minas Gerais State, Brazil*

Corresponding author at: Rua Desembargador Assis Rocha,
279, Bairro Belvedere, 30320-250 Belo Horizonte City,
Minas Gerais State, Brazil. Tel.: + 55 31 3286 1892 (Residence), + 55
31 3286 7315 (Office).

E-mail addresses: adilzadode@mreengenharia.com.br,
mreengenharia@mreengenharia.com.br, adilzadode@terra.com.br
URL: <http://www.mreengenharia.com.br>

Mônica Maria DinizLeão

*UFMG – Universidade Federal de Minas Gerais – Belo Horizonte,
Environmental and Sanitary Engineering Department, Belo Horizonte
City, Minas Gerais State, Brazil*

Francisco de Assis FerreiraTejo

*UFMG – Universidade Federal de Campina Grande – Center of Electrical
Engineering and Informatics, Academic Unit of Electrical Engineering,
Paraíba State, Brazil*

30 September 2012
Available online xxxx