

Original Research Paper

Information of Use, Profile, Consumption and Health Disorders Related to Pesticide in the State of Sao Paulo, Brazil. Problem of Health due Pesticides in the State of São Paulo-Brazil, 2004 to 2014

Telma de Cassia dos Santos Nery^{1*}, Rogério Araujo Christensen¹, Clarice Umbelino de Freitas², Roseane Maria Garcia Lopes de Souza¹, Golda Schwartzman¹, Farida Conceicao Pereira¹ and Graziela Almeida da Silva¹

¹State Secretary of Health, Epidemiological Surveillance Center, Division of Diseases Caused by Environment, SP, Brazil
²Autonomous Researcher

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Global expenditures on pesticides grow continuously. Brazil is the world's largest consumer of pesticides responding in Latin America with 86% of the products. In 2011, the State with most consumed pesticides in Brazil was Sao Paulo - 346,079.2 ton. Brazil is a country with 5.569 municipalities in 27 units of the federation. Studies show that consumption of pesticides per capita in Brazil is about 5 liters per year. São Paulo is the most populous State in Brazil with 42,000,000 inhabitants. The Epidemiological Surveillance Center of the State Health Secretariat has structured an observatory to provide information about the pesticides consumption, characteristics of substances and main health grievances, enabling descriptive studies and thematic maps of deaths related to consume or exposure to pesticides for different regions of the State of São Paulo. Maps with the consumption of pesticide were constructed in order to contribute to subsequent analysis by teams of health services in the State of Sao Paulo. Preliminary analysis of the information showed an increased consumption and use of pesticides without increase in the cultivated area. Also revealed that the grievances: hospitalizations, cases of cancer, poisoning can be analyzed for each pesticide in each municipality. Shows graphics of poisonings reported in the Brazilian Health Surveillance System (SINAN) with the hospitalizations by poisoning and the diagnosis of the epidemiological profile of pesticide poisoning in the State of São Paulo. The construction of thematic maps serve as guides for initial actions in health surveillance of the population exposed or potentially exposed to pesticides.

Keywords: Pesticides and Health, Exogenous Intoxication, Environmental Intoxication, Notification in Public Health.

INTRODUCTION

Global expenditures on pesticides grow continuously. Brazil is the world's largest consumer of pesticides responding in Latin America, for 86% of the products. From the total of pesticides consumed in Brazil, 58% are herbicides, 21% are insecticides, 12% are fungicides, 3% are acaricides and 7% are others. In 2011, the state that consumed most pesticides in Brazil was Sao Paulo (346,079.2 ton). Brazil is a country with 5.569 municipalities distributed in 27 units of the Federation; its population is 220 million inhabitants and the total area is

8.514.215 km². Studies show that consumption of pesticides per capita in Brazil is about 5 liters per year. São Paulo is the most populous state in Brazil with 42 million inhabitants has 645 municipalities and is the largest industrial and economic region. Represents 33 % of GDP (PIB), aggregates and concentrates 50 % of the industrial park of the country. About 120,000 industries which 1900 account with 90% of the most serious and dangerous industrial pollution, we expect to identify various health problems, but notifications are not

shown. The Epidemiological Surveillance Health Center Registry structured an Observatory to provide information of the characteristics consumption of pesticides and main health grievances of population available.

OBJECTIVE

Build and analyze thematic maps related to deaths caused by pesticides in different regions of the State of São Paulo.

METHODOLOGY

Descriptive study conducted by a multidisciplinary team with doctors, nurses and engineers. Initially, it was reviewed extensive bibliographic about the use and consumption of pesticides in Brazil and in the State of Sao Paulo. Alongside were raised health databases about hospital admissions, deaths and medical diagnostics. It was conducted survey of deaths from causes that may be related to consuming or exposure pesticides in the State of Sao Paulo. Later maps of consumption of pesticide were constructed in order to contribute to subsequent analysis by teams of health services. This study analyzes through thematic maps, health data by sex

and age related pesticide poisoning, deaths from breast cancer, genital cancer, endocrine cancer and consumption of pesticides by the state. Analysis of regions shows a higher incidence in the regions of within the state. We used data from the Health Ministry of Brazil, Datasus.

ANALYSIS AND RESULTS

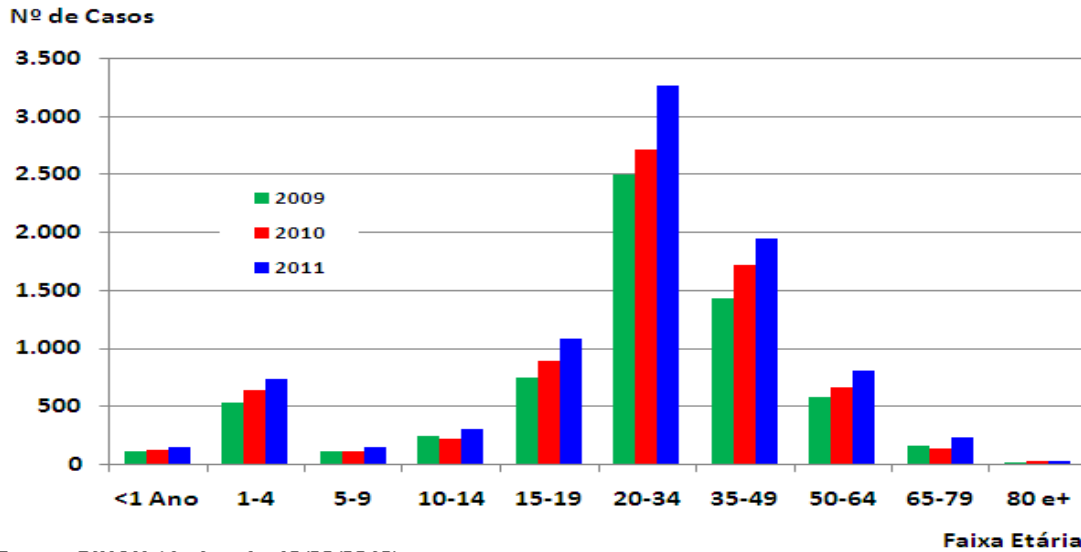
The analysis of the information and available data reveal that increased consumption and use of pesticides occur without a large increase in the planted area. Also reveal that the grievances, hospitalizations, cases of cancer, poisoning can be analyzed for each municipality. The analyses allow observing, systematically and geographically, the consumption of pesticides and their relationship with some health problems. In 2010, the Brazilian market of pesticides moved US\$ 7.3 billion, 19% of the global market. Below are shown, graphics (1, 2 and 3), the number of poisonings reported in Brazilian surveillance system, SINAN and the rate of hospitalizations for health problems, available on maps (1-10). These maps show the consumption diagnosis of pesticides and the diagnosis of the epidemiological profile of pesticide poisoning in São Paulo.

Graphic 1: Number of intoxications by pesticides notifications, SINAN Years 1999 to 2012, Brazil



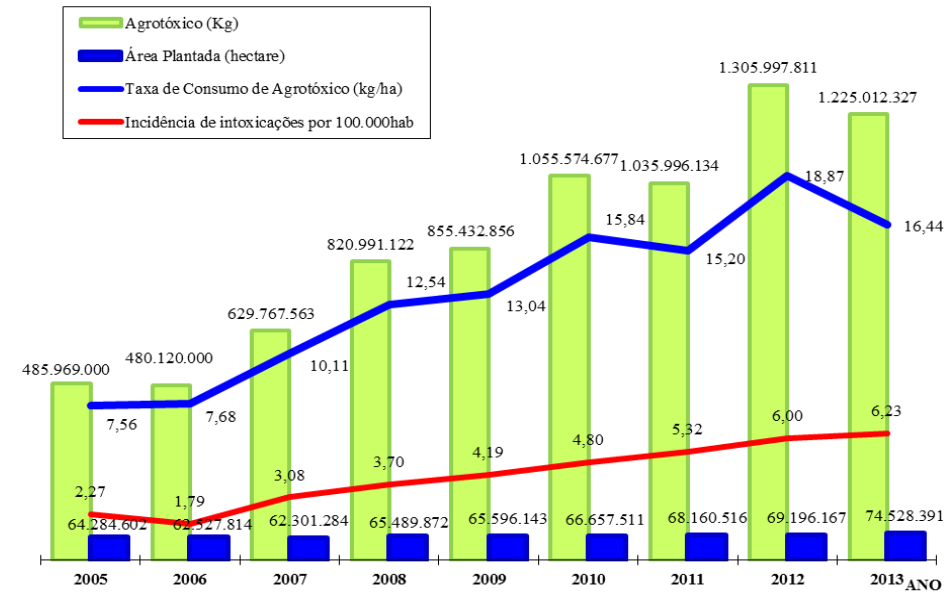
Source: SINAN

Graphic 2: Cases of Intoxication by age groups, State of Sao Paulo/Brazil, SINAN, Years 1999 to 2012



Fonte: SINAN (dados de 12/09/2012)
Source: SINAN

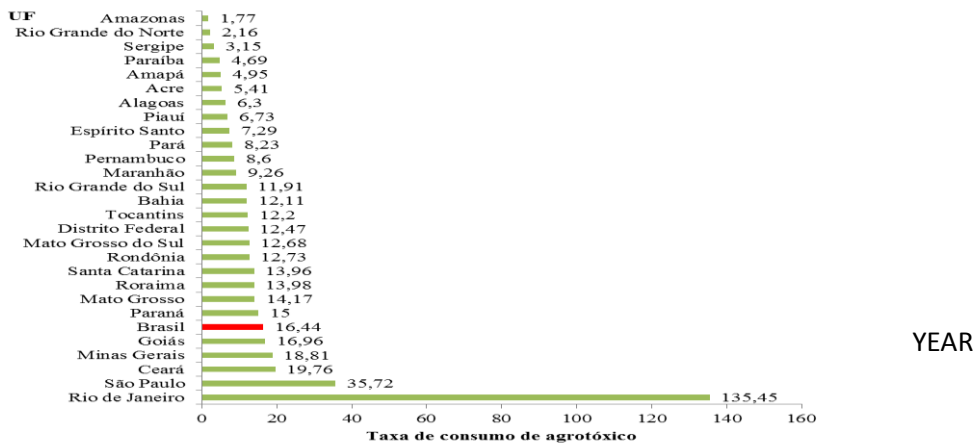
Graphic 3: Use of pesticides, active ingredients, area and notification of health problem in Brazil, 2005 a 2013



Source: SINAN, IBGE and AGROFIT

Sao Paulo State has a large consumption of pesticide; it is the second major rate when analyzed by the Unit of the Federation (UF). Below are shown consumption rates for each State, of Brazil.

Pesticide consumption rate (kg/ ha) per Unit of the Federation, Brazil, 2013



Source: AGROFIT and IBGE, 2013

According to the Collective Health Brazilian Association (Abrasco), this is the list of cultures that consumes more pesticides:

- ✓ Soy (40%)
- ✓ Maize (15%)
- ✓ Sugarcane and cotton (10% each)
- ✓ Citrus (7%)
- ✓ Coffee, wheat and rice (3% each)
- ✓ Bean (2%)
- ✓ Potatoes (1%)
- ✓ Tomato (1%)
- ✓ Apple (0.5%)
- ✓ Banana (0.2%)
- ✓ Other crops consumed 3.3% of the total of 852.8 million liters of pesticides sprayed on Brazilian crops in 2011.

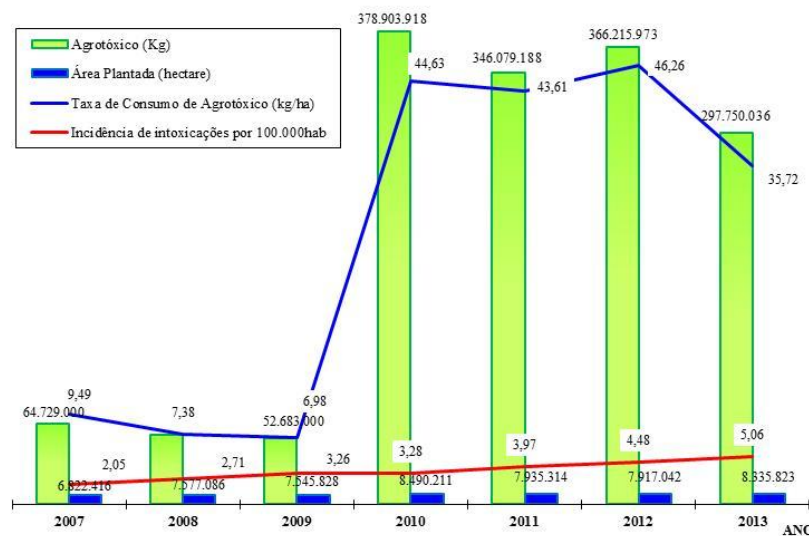
The pesticides most commonly consumed in Brazil in the period 2013-2014 are listed below. Some of them are already classified by IARC as carcinogens (ex: Glifosato).

Agrotóxicos químicos	Total (kg) 2013	Total (kg) 2014
Glifosato *	411.343.703,0	432.270.786,5
Atrazina (triazina)	57.303.387,9	35.397.501,7
Óleo mineral (hidrocarbonetos alifáticos)	49.646.785,9	52.239.957,3
Acefato (organofosforado)	42.472.574,4	48.891.645,9
Metomil (metilcarbamato de oxima)	41.420.919,3	48.502.231,7
Clorpirifós (organofosforado)	36.821.042,7	46.761.072,8
2,4-D (ácido ariloxialcanóico)	28.264.642,3	27.345.721,9
Dicloreto de paraquate (bipiridílio)	27.680.287,1	32.920.024,6
2,4-D-dimetilamina (ácido ariloxialcanóico)	25.832.813,6	24.770.753,1
Carbendazim (benzimidazol)	17.824.758,9	15.307.157,8

Source: AGROFIT, 2013 e 2014

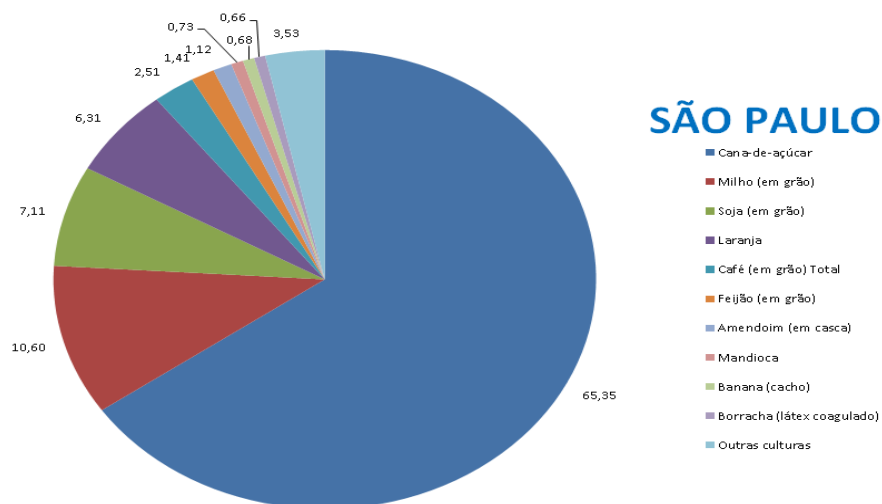
Sao Paulo State data's are shown below, which appoint large increase in the consumption of pesticides from 2010 to 2013 (Graphic 4)

Graphic 4: Use of pesticides, ingredients, area and notification health problem in São Paulo State, Brazil, 2007 a 2013



Source: SINAN, IBGE and AGROFIT

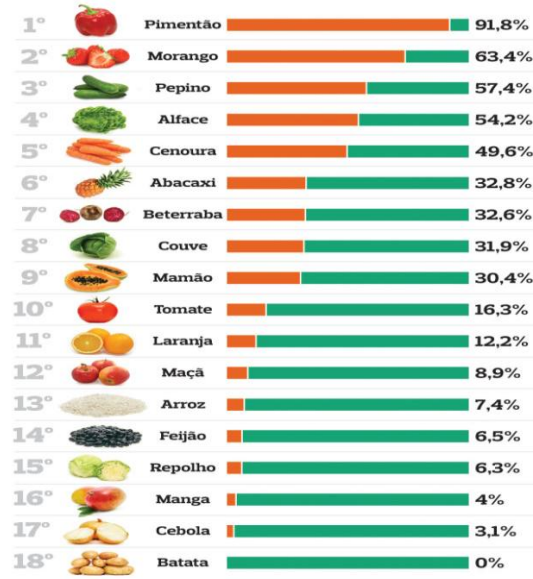
Graphic 5: Range of main cultures, Sao Paulo - Brazil, 2012



Source: SIDRA/IBGE

Data from the national program for pesticide residue analysis in food (ANVISA), points out the pepper as food over irregularities.

Ranking de alimentos que apresentam mais irregularidades no uso de agrotóxicos

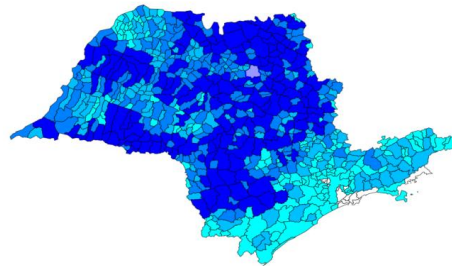


Fonte: Programa de Análise de Resíduos de Agrotóxicos de Alimentos (Para) da Agência Nacional de Vigilância Sanitária (Anvisa)

Source: ANVISA

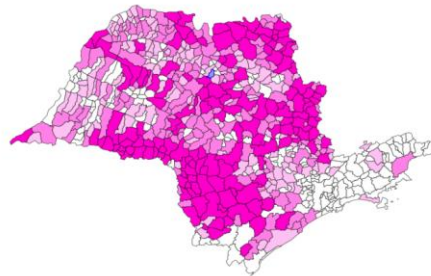
Maps 1 and 2 shows the distribution of consumption of pesticides Glyphosate and Chlorpifiros by municipalities of the São Paulo State in 2013

Map 1: Consumption of Glyphosate by municipalities of São Paulo State in 2013



Source: CVE (www.observatoriosadeambiental.eco.br access 01/26/2016)

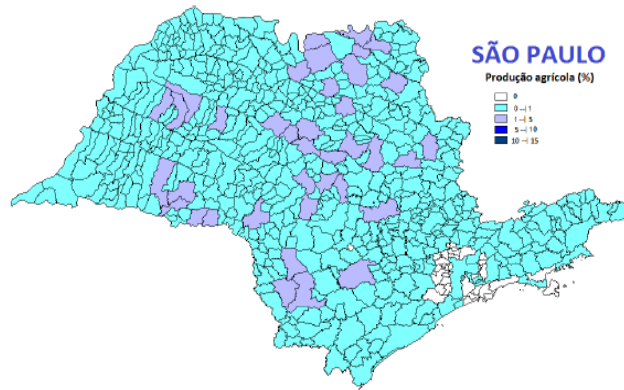
Map 2: Consumption of Chlorpifiros by municipalities of São Paulo State in 2013



Source: CVE (www.observatoriosadeambiental.eco.br access 01/26/2016)

The agricultural production by municipalities of Sao Paulo State is shown in the map 3.

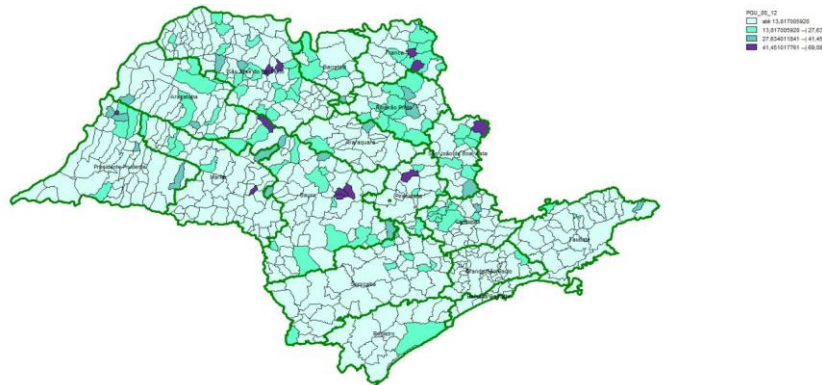
Map 3: Agricultural production by municipality in the Sao Paulo State, 2012



Source: SIDRA-IBGE

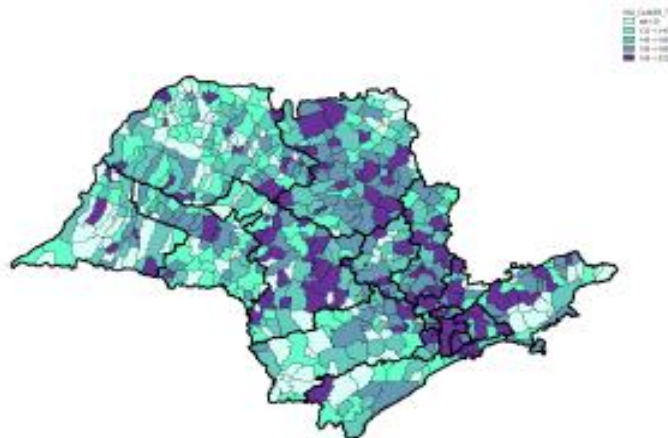
The geographical analysis of the main health problems in the state of São Paulo, are shown on maps 4-10, where are observed intoxication rates and deaths from pesticides, breast cancer in women, cancer death, congenital malformation in the genitourinary system. These analyses allow you to specify and qualify the remarks of injuries to a comparative analysis with consumption of pesticides by municipality.

Map 4: Congenital malformation rate of genitourinary system per 100 thousand live births



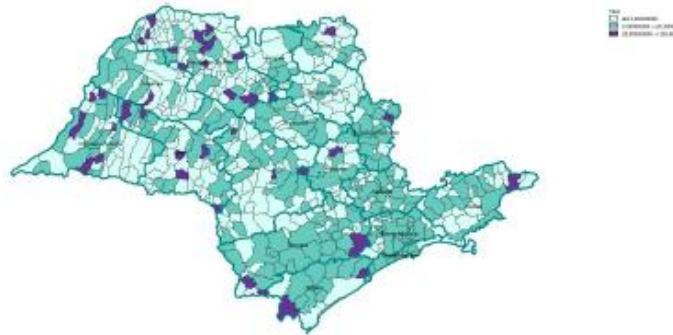
Source: CVE (www.observatoriosaudefambiental.eco.br access 01/26/2016)

MAP 5: Standardized death rate from cancer by residence in Sao Paulo State, 2000 to 2012



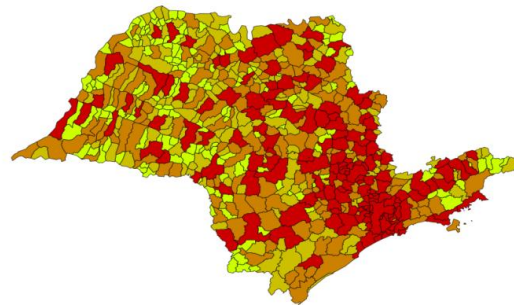
Source: CVE (www.observatoriosaudefambiental.eco.br access 01/26/2016)

MAP 6: Standardized rate of death due to poisoning by pesticides per 100,000 inhabitants in Sao Paulo State - 2000-2012



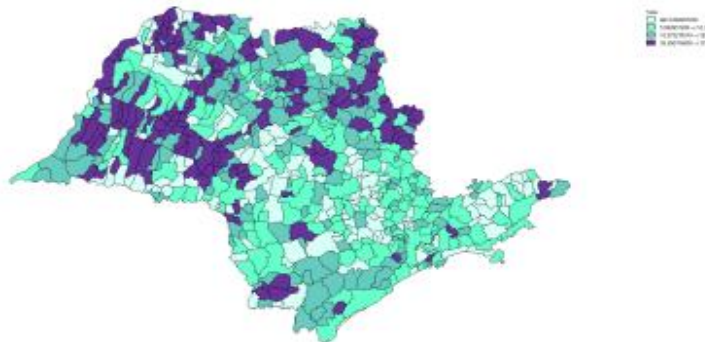
Source: CVE (www.observatoriosauambiental.eco.br access 01/26/2016)

MAP 7: Overall rate of Cancer – Sao Paulo State - 2000-2012



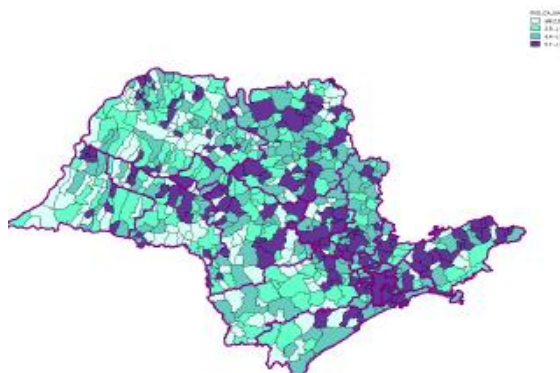
Source: CVE (www.observatoriosauambiental.eco.br access 01/26/2016)

MAP 8: Hospitalization by exogenous intoxication – Sao Paulo State - 2000 to 2012

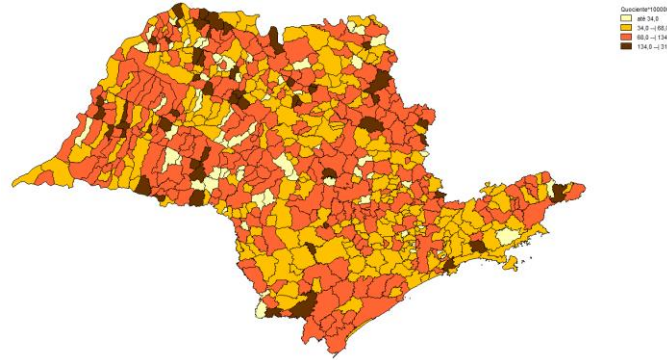


Source: CVE (www.observatoriosauambiental.eco.br access 01/26/2016)

MAP 9: Death by endocrine disease -Sao Paulo State - 2001 to 2011



Source: CVE (www.observatoriosauambiental.eco.br access 01/26/2016)

MAP 10: Standardized rate of male genital cancer - Sao Paulo State - 2000-2012

Source: CVE (www.observatoriosaudeambiental.eco.br access 01/26/2016)

CONCLUSION

The construction of thematic maps give guides for first actions in health surveillance of exposed or potentially exposed population to pesticides.

REFERENCES

- ANVISA - Relatório complementar relativo à segunda etapa das análises de amostras coletadas em 2012. Programa de análise de resíduos de agrotóxicos em alimentos (PARA). ANVISA, 2014 (a). Acesso em 01/06/2015. Disponível em: http://portal.anvisa.gov.br/wps/wcm/connect/d67107004634368583a5bfec1b28f937/Relat%C3%B3rio+PARA+2012+2%C2%AA+Etapa++17_10_14-Final.pdf?MOD=AJPERES
- ANVISA - Relatório de atividades de 2011 e 2012. Programa de análise de resíduos de agrotóxicos em alimentos (PARA). ANVISA, 2014 (b). Acesso em 01/06/2015. Available in: http://portal.anvisa.gov.br/wps/wcm/connect/d480f50041ebb7a09db8bd3e2b7e7e4d/Relat%C3%B3rio%2BPARA%2B2011-12%2B-%2B30_10_13_1.pdf?MOD=AJPERES
- Bastos LHP, Cardoso MHW, Nóbrega AW, Jacob SC. (2011). Possíveis fontes de contaminação do alimento leite, por agrotóxicos, e estudos de monitoramento de seus resíduos: uma revisão nacional. *Cad. Saude Colet.*, 19(1): 51-60.
- Bucaretych F, Prado CC, Branco MM, Soubhia P, Metta GM, Mello SM, Capitani EM et al. (2012) Poisoning by illegal rodenticides containing acetylcholinesterase inhibitors (chumbinho): a prospective cases series. *Clinical toxicology*, 50: 44-51. 75
- Carneiro FF (org). Dossiê ABRASCO – Um alerta sobre os impactos dos agrotóxicos na saúde. (2015). Organização de Fernando Ferreira Carneiro, Lia Giraldo da Silva Augusto, Raquel Maria Rigotto, Karen Friedrich e André Campos Búrgio – Rio de Janeiro: EPSJV; São Paulo: Expressão Popular. 624p.
- EU – European Commission.(2015). Endocrine Disruptors. Disponível em: http://ec.europa.eu/environment/chemicals/endocrine/strategy/euapproach_en.htm. Consulta em 26/07/2015. 76
- EU – European Commission.(2002 (a)). Endocrine Disruptors: List of 564 substances with their selection criteria. Annex 10. Disponível em: http://ec.europa.eu/environment/archives/docum/pdf/bkh_annex_10.pdf. Consulta em 28/07/2015.
- EU – European Commission.(2002 (b)). Endocrine Disruptors: Study on gathering information on 435 substances with insufficient data. Final report: Annex4. Disponível em: http://ec.europa.eu/environment/chemicals/endocrine/pdf/bkh_report.pdf#page=1. Consulta em 28/07/2015.
- EU – European Commission. (2007). Study on enhancing the endocrine disrupter priority list with a focus on low production volume chemicals. May, 2007. Acesso em 27/07/2015. Disponível em: http://ec.europa.eu/environment/chemicals/endocrine/pdf/final_report_2007.pdf
- IARC - International Agency for Research on Cancer. IARC monographs on the evaluation of carcinogenic risks to humans. WHO, 2015. Acesso em 01/06/2015. Disponível em: <http://monographs.iarc.fr/>
- IPCS - International Programme on Chemical Safety.(2002). Global assessment of the state-of-the-science of endocrine disruptors. Geneva, Switzerland, World Health Organization, International Programme on Chemical Safety.
- Luiz RR, Struchiner CJ. Causalidade e epidemiologia. In: Inferência causal em epidemiologia: o modelo de respostas potenciais [online]. Rio de Janeiro: Editora FIOCRUZ, 2002. 112 p. ISBN 85-7541-010-5. Disponível em SciELO Books. <http://books.scielo.org/id/p2qh6/pdf/luiz-9788575412688-04.pdf>
- Nero LA, Mattos MR, Beloti V, Barros MAF, Pontes Netto D, Franco BDGM. (2007). Organofosforados e carbamatos no leite produzido em quatro regiões leiteiras no Brasil: ocorrência e ação sobre *Listeria monocytogenes* e *Salmonella* spp. *Cienc. Tecnol. Aliment.*, 2(1): 201-204.
- Rigotto RM, Vasconcelos DP, Rocha MM (2014). Uso de agrotóxicos no Brasil e problemas para a saúde pública. *Cad. Saúde Pública*, 30(7): 1-3.
- WHO - World Health Organization. Possible developmental early effects of endocrine disrupters on child health. Library Cataloguing-in-Publication Data. WHO, 2012.
- WHO/UNEP - World Health Organization/ United Nations Environment Programme. State of the science of endocrine disrupting chemicals 2012. edited by Ake Bergman, Jerrold J. Heindel, Susan Jobling, Karen A. Kidd and R. Thomas Zoeller. WHO/UNEP, 2013.