Mapping the Probable Daily Poisoning Incidents According to the Individuals Demographics

Sophie Barguil
Mapping the probable daily poisoning incidents according to the individuals demographics

Sophie Barguil*

Abstract: On a daily basis, individuals are exposed to potential poisoning by different sources such as medicines, food, alcohol, pesticides, and chemical cleaning materials. In these circumstances, individuals often need to undergo medical emergency interventions to manage the serious consequences that can appear simultaneously with the poisoning or in the long term.

Indeed, the nature and circumstances of daily poisoning cases vary among socio-demographic backgrounds. This fact requires the development of a medical emergency system that integrates emergency toxicity treatments. This perspective further suggests the development of appropriate prevention and treatment programs according to the geographical distribution of the recorded daily poisoning incidences.

A database was built in regards to the many acute poisoning cases recorded in a number of emergency facilities based on four geographical zones in Syria. The data included the source of the poisoning and the individual’s identity demographics, like age, gender, profession, the area of residence, and employment. The statistical analysis proved that there is an evident relationship between the types of poisoning.

ABOUT THE AUTHOR

Dr. Sophie Barguil is a Pharmacy Faculty Member at Damascus University, Department of Pharmacology and Toxicology. She is interested in the issue of pollution and public health; thus, she was director of MSc. and Ph.D. theses, where she conducted several research projects on the internal and external air pollution, smoking, pesticides, alcohol, cancer and toxic materials. Furthermore, she is qualified and instructed to do the toxicological toxic analyzes, where she completed a fifty for the Criminal Security Division. Moreover, she has been a member of the juror of MSc. and Ph.D. theses; and a member of the Standing Committee for Pesticides and Domestic Pesticides at the Ministry of Health. She participated in several local and regional conferences and symposia as well as several scientific events related to pollution and public health.

PUBLIC INTEREST STATEMENT

Poisoning is one of the daily incidents whose nature and causes are so different; although its appearance is biologic-medical, it is always linked to factors of social, educational and economic identity.

In addition, if the disease could be predicted from the anticipated symptoms, and can be treated in the short or long term, daily poisoning is an unexpected health calamity that medicine may treat in the short term through medical measures, but it can in many cases cause incurable, even disastrous, acute residual injuries that are difficult to treat.

This highlights the need to implement appropriate human development projects starting on the one hand with prevention and vigilance information programs, and the installation of anti-poisoning medical center supported by the devices and the means adequate according to the nature and the socio-economic situation of each geographical site.

This work seeks to show the basic conjuncture between daily poisoning incidents and the socio-economic aspect of the individual in question.
daily poisonings and the demographics of the individuals poisoned including the geographical location.

Thus, this study showed the importance of developing a probabilistic mapping on a national scale of the possible daily poisoning incidents based on the individuals’ demographics. Furthermore, this approach allows local and national authorities to develop anti-poisoning centers and provide the equipment and most appropriate medical materials according to the needs of each region.

Subjects: Public Relations; Risk Communication; Health Communication; Health & Development; Population & Development; UrbanDevelopment; Health & Society; Public Health Policy and Practice

Keywords: daily poisoning; public health; health prevention; poisoning database; data analysis

1. Introduction

The number of substances with toxic effects exceeds 100,000. Most of these require quick and appropriate treatment due to their catastrophic effects such as death, blindness, and nervous system damage (Attazagharti, Soulaymani, Ouami, Mokhtari, & Soulaymani, 2009). Therefore, preventing poisonings has become a critical issue.

According to the Health Prevention Convention, the concept of prevention defines “all measures, attitudes, and behaviors that tend to prevent disease or injury or to maintain and improve health” (WHO, 2004). Given the importance of this topic, in 2004 the World Health Organization (WHO) developed the International Program on Chemical Safety (IPCS). The program classified the poisoning cases and the actions taken to reduce their side effects into two categories (according to patterns of poisoning):

- Acute poisoning: takes place in the respiratory route or digestive tract and leads to the emergence of certain health indicators and symptoms (Bertin & Averbeck, 2006; Bourdillon, Brucker, & Tabuteau, 2016), wherein some cases lead to death (Sidibe, Kone, Keita, Coulibaly, & Achourbecova, 1991).
- Chronic poisoning: affects various body organs such as the respiratory system, the digestive system, the nervous system, and the reproductive system (Ishido, Homma, Leung, & Tohyama, 1995; Koizumi, Li, & Tatsumoto, 1992; Scherer, 2004). In this case, poisoning may cause tissue damage and the emergence of chronic health symptoms, in the form of direct or chronic effects depending on the nature and intensity of poisoning (Palus et al., 2003).

In 1997, the World Health Organization, in collaboration with the United Nations Environment Program (UNEP) and the International Labor Organization (ILO), established a guideline to assist countries in establishing or strengthening prevention and poisoning management facilities (World Health Organization [WHO], 1997).

To reach this target, many researchers have proposed using geographic information systems (GIS) for disease control and prevention as guidance for state and local health agencies (Center for disease control and prevention, 2004; Kim, Staley, Curtis, & Buchana, 2002). The usefulness of this system was proven when it was applied to identify children with high-risk exposure to lead in the USA. A survey was conducted where the criterion used was blood lead levels (BLLs) and residential locations of high-risk children living in housing built before 1950 or in areas with a high proportion of older housing (Braggio, Cadaret, Fletcher, & Allen, 2003; Reissman et al., 2001). The local state authorities then commissioned a warning and prevention system to assess the danger of lead poisoning and drug overdose (Michigan Department of community health, 2014). Therefore, in 2004 the center for disease control and Prevention (CDC) in the USA developed a geographic
information system (GIS) to assess and direct childhood lead poisoning prevention (Roberts, Hulsey, Curtis, & Reigart, 2003).

2. Significance of research
Nowadays, daily poisonings potentially threaten individuals through various ways and substances that are present in their surrounding environment and their daily activities. The main daily poisoning sources are found in common items such as food, alcohol, pesticides, drugs, and chemical and cleaning sources. For example, in 2003 there was an incident of alcohol poisoning in Tartus (a Syrian city) where about 65 individuals were subject to poisoning by a homemade alcoholic drink. Some of those poisoned became blind (Barguil, 2015).

The subject of daily poisoning has become a crucial social issue that requires the treatment system for it must transition from a purely therapeutic toxicological treatment to an integrated system. This measure allows for not only the treatment of the medical aspects associated with poisoning but also a change in the social and cultural points of view (Barguil et al., 2010). This requires the development of a prevention and health care program along with the required laws and regulations.

The provisions and infrastructure of an integrated toxicological treatment are justified by the fact that daily poisoning is no longer simply a health or exceptional problem. This phenomenon has become very widespread as the result of civil and industrial development. It deserves the attention of those who are interested in public affairs and the health sector. It most definitely requires a serious review of legislation and laws on health protection systems, treatment methods, and availability of hospitals, medicines, tools, and qualified medical personnel.

Hence, it seems useful to examine scientifically the issue of daily poisoning to provide a serious vision for an integrated prevention project. There is a justifiable need for national cartography to classify probable daily poisoning and discover information programs and an adequate prevention system that takes into account the social, economic, and cultural dimensions of each geographical area. Therefore, the objective of the research is to investigate the relation between the nature of daily poisonings and citizens’ demographic data by a simple statistical method.

3. Materials and methods

3.1. Demographic database
Personal and clinical information concerning the acute poisoning incidents recorded in May 2010 in some emergency service facilities formed the database of this study. The public emergency services are located in four typical geographical zone areas in Syria (Figure 1). This geographical distribution provides a variety of demographic, economic, and cultural indicators. Table 1 shows some basic statistical data, which describe the social characteristics of these zone areas (Statistical Indicators and National Accounts Statistics, for the years 2009 and 2010 n.d.).

The collected data regarding poisoning cases was classified as food poisoning, alcohol poisoning, drugs, insecticides, coal oil derivatives, animal toxins (e.g., snake or scorpion venom), and unknown substances. Likewise, the poisoning cases were classified according to the patient’s demographics of gender, age, educational level, profession, and social status and the state of the patients after treatment (Tables 2–6).

It is important to note that due to the absence of poison control centers in Syria, the treatment of such cases is currently the responsibility of hospital emergency rooms. The medical staff in these facilities obtains only the information that concerns the nature of the poisoning incident. The medical personnel in these hospitals are only interested in how to treat the patient by providing the appropriate antidote. Thus, rarely emergency service provides a detailed poisoning analysis.
Table 1. The social characteristics of the studied geographical zone areas.

| Statistical Characteristics                                      | Geographical Zone Areas |
|------------------------------------------------------------------|-------------------------|
|                                                                 | A | B | C | D |
| Population density persons/km²                                   | 3,000 | 100 | 430 | 260 |
| Population growth rate %                                         | 1.3 | 1.8 | 1.6 | 2.5 |
| Dependency rate                                                  | 3.6 | 3.5 | 3.3 | 4.8 |
| Proportion of illiteracy and basic education to total working population% | 45 | 43 | 33 | 55 |
| Proportion of graduate persons to total working population %     | 23 | 18 | 28 | 13 |

Table 2. Source of poisoning

| Geographical Zone Areas |
|-------------------------|
|                          | A | B | C | D |
| Total Cases              | 142 | 93 | 70 | 83 |
| (100%)                  | (100%) | (100%) | (100%) |
| Food                    | 45 | 12 | 51 | 26 |
| (31.7%)                 | (12.9%) | (72.9%) | (31.3%) |
| Alcohol                 | 34 | 25 | 8 | 5 |
| (23.9%)                 | (26.9%) | (11.4%) | (6.0%) |
| Drugs                   | 30 | 21 | 6 | 6 |
| (21.1%)                 | (22.6%) | (8.6%) | (7.2%) |
| Coal Oil Derivatives    | 22 | 10 | 1 | 20 |
| (15.5%)                 | (10.8%) | (1.4%) | (24.1%) |
| Insecticides            | 8 | 17 | 2 | 18 |
| (5.6%)                  | (18.3%) | (2.9%) | (21.7%) |
| Animal toxins*          | 3 | 8 | 2 | 8 |
| (2.1%)                  | (8.6%) | (2.9%) | (9.6%) |

*Animal toxins such as snake or scorpion venom.
### Table 3. Gender distribution

| Gender | Geographical Zone Areas | A  | B  | C  | D  |
|--------|--------------------------|----|----|----|----|
| Female |                          | 73 | 43 | 42 | 45 |
|        |                          | (51.4%) | (46.2%) | (60.0%) | (54.2%) |
| Male   |                          | 69 | 50 | 28 | 38 |
|        |                          | (48.6%) | (53.8%) | (40.0%) | (45.8%) |

### Table 4. Age distribution

| Age Group | Geographical Zone Areas | A  | B  | C  | D  |
|-----------|--------------------------|----|----|----|----|
| 0–10      |                          | 10 | 7  | 1  | 8  |
|           |                          | (7.0%) | (7.5%) | (1.4%) | (9.6%) |
| 11–18     |                          | 29 | 14 | 6  | 17 |
|           |                          | (20.4%) | (15.1%) | (8.6%) | (20.5%) |
| 19–25     |                          | 33 | 25 | 26 | 24 |
|           |                          | (23.2%) | (26.9%) | (37.1%) | (28.9%) |
| 26–35     |                          | 35 | 22 | 21 | 19 |
|           |                          | (24.6%) | (23.7%) | (30.0%) | (22.9%) |
| 36–45     |                          | 20 | 15 | 11 | 9  |
|           |                          | (14.1%) | (16.1%) | (15.7%) | (10.8%) |
| 46–55     |                          | 10 | 8  | 4  | 4  |
|           |                          | (7.0%) | (8.6%) | (5.7%) | (4.8%) |
| 56–100    |                          | 5  | 2  | 1  | 2  |
|           |                          | (3.5%) | (2.2%) | (1.4%) | (2.4%) |

### Table 5. Profession and education situation

| Qualification | Geographical Zone Areas | A  | B  | C  | D  |
|---------------|--------------------------|----|----|----|----|
| Post-graduate |                          | 12 | 7  | 19 | 2  |
|               |                          | (8.5%) | (7.5%) | (27.1%) | (2.4%) |
| Graduate      |                          | 10 | 8  | 6  | 2  |
|               |                          | (7.0%) | (8.6%) | (8.6%) | (2.4%) |
| Student       |                          | 36 | 28 | 15 | 16 |
|               |                          | (25.4%) | (30.1%) | (21.4%) | (19.3%) |
| Housewife     |                          | 29 | 9  | 17 | 17 |
|               |                          | (20.4%) | (9.7%) | (24.3%) | (20.5%) |
| Children      |                          | 15 | 14 | 1  | 14 |
|               |                          | (10.6%) | (15.1%) | (1.4%) | (16.9) |
| Worker and Laborer |                   | 32 | 16 | 11 | 11 |
|               |                          | (22.5%) | (17.2%) | (15.7%) | (13.3%) |
| Farmer        |                          | 8  | 11 | 1  | 21 |
|               |                          | (5.6%) | (11.8%) | (1.4%) | (25.3%) |
3.2. Poisoning incidences analysis
The collected data were organized in tables (Tables 2–6) and then transformed into percentage values to be presented in the form of a histogram. The use of this simple method highlighted the underlying relationships that may exist between the different types of poisoning and the geographical zone areas along with the demographics of the educational level, sex, age, and social status of the poisoned individuals. This method also helped to discover the most dominant poisoning phenomena in each region.

4. Discussion of analysis results

4.1. Overall poisoning incidences
The distribution of poisoning indicates that people in all geographical areas were affected mostly by food poisoning (34.5%) and rather less by alcohol, drugs, coal oil derivatives, and animal toxins. (Figure 2).

4.2. Role of gender
The poisoning frequency based on gender (Figure 3) shows that males were distinguished by alcohol poisoning at 34.8% of total male cases, but food poisoning strongly affected females at

| Health Status | Geographical Zone Areas |
|---------------|-------------------------|
|               | A | B          | C | D          |
| Blind         | 0 | 2          | 0 | 0          |
|               | (0.0%) | (2.2%) | (0.0%) | (0.0%) |
| Death         | 12 | 6          | 0 | 11         |
|               | (8.5%) | (0.0%) | (0.0%) | (13.3%) |
| Treated and Saved | 130 | 85 | 70 | 72 |
|               | (91.5%) | (91.4%) | (100%) | (86.7%) |

Figure 2. Distribution of poisoning cases by sources overall in all geographical areas of study.

Figure 3. Distribution of poisoning cases by sources between males and females overall in all four geographical areas.
45.3% of the total female cases and insecticides reached 17.4% only of female poisoning cases. However, there was a quite symmetrical distribution between males and females for drugs, coal oil derivatives, and animal toxins. This is believed to be due to the ignorance and lack of vigilance among females whereas alcohol poisoning is due to the habit of its consumption by men rather than women.

4.3. Role of age
The number of incidents for each source of poisoning, recorded by age range, showed food poisoning as the most dominant (Figure 4-a). People mostly poisoned by food were those of age between 26–35 at 34.3% and 19–25 years old at 23.9% (Figure 4-b). Furthermore, alcohol came in as the second source of poisoning as the distribution was symmetrical unimodal. The ranges of age for poisoning by alcohol became wider than that for food and included adults of the ages of 36–45 years old. These ranges presented a rate of 22.2% (19–25), 26.4% (26–35), and 25.0% (36–45) of the total alcohol poisoning cases.

Moreover, drugs skewed towards young people and affected mostly age ranges between 11–18 and 19–25-year-olds, which present 27.0% and 34.9% respectively of all drug cases. Coal oil derivatives and insecticides were less recorded, but particularly affected young people from ages 11 to 25 years old.

For animal toxins, the number of poisoning incidents was relatively minute. It affected mostly young children under 10 years of age and presented 47.6% of all animal toxin poisoning incidents (Figure 4-b).

4.4. Role of social profile
The number of incidents recorded for all social categories (professions and educational levels) was highest for food poisoning and somewhat less for that of alcohol and drugs (Figure 5-a). The distribution of poisoning by source shows a multimodal distribution between different social categories (Figure 5-b).

The most distinguished daily poisoning was food poisoning. The most affected people were postgraduates, students, housewives, and workers. The rate of poisoning varied from 14.9% to 22.4% of the total food poisoning cases. Moreover, the people affected by alcohol poisoning were mostly

---

**Figure 4.** a Number of poisoning cases by source for different ranges of age. b Distribution of poisoning incidents for each age range recorded for each poisoning source (Number of poisoning recorded for such age range/total number of incidents recorded for all ages).
students and then next came postgraduates at rates of 27.8% and 18.1%, respectively. Otherwise, students and housewives were the most affected by drugs at rates of 28.6% and 22.2%, respectively.

For coal oil derivatives, students were the most affected at 37.7% of the population’s sample. Insecticides hurt most of the people except postgraduates and graduates.

4.5. Poisoning according to geographical zones

The analysis of poisoning distribution by geographical zones showed a distinguished difference between different areas. Results show a similar rate of poisoning incidents between males and females (Figure 6-a) overall and in each of the four local areas investigated, with a slightly higher proportion of females being poisoned except in Zone B.

The range of age shows a symmetrical unimodal distribution in all Syrian territorial (Figure 6-b). The highest frequency of people affected by poisoning was in the range of 19–25 and 26–35 years old. Additionally, the highest percentages according to the social profile of professional and educational level belonged to the students, housewives, and workers (Figure 6-c). Nevertheless, the nature of poisoning varies significantly from region to other (Figure 6-d).

Meanwhile, the daily poisoning distribution in each zone area could be summarized as the following:

In Zone A, the distribution of poisoning from all sources was similar with a slight difference for the overall scale for gender, age, and social profile criteria. This similarity is justified by the fact that the capital city is a cluster of people from different regions and backgrounds, which reflects a global scale.

By comparison, in Zone B the effect of the source was relatively symmetrical with a slight advantage for males (Figure 3-a), particularly for alcohol, drugs, and insecticides but far less for food poisoning (Figure 6-d). However, the age ranges that were mostly poisoned were 19–25 and 26–35 years old (Figure 6-b). In addition, students were the most affected in all social categories (Figure 6-c).
People in the coastal area, Zone C, were hugely impaired by food poisoning (Figure 6-d) and less affected by other sources. The age ranges mostly concerned with poisoning were those of 19–25 and 26–35 years old and belonged to postgraduates, students, and housewives (Figure 6-b,c).

In Zone D, the distribution of people troubled by poisoning was symmetrical between all social categories (Figure 6-c), except a very low presence of postgraduates and graduates with similar distribution for ages overall. The most common poisoning was food poisoning, coal-oil derivatives, and insecticides. Alcohol and drug poisoning cases were very limited in this zone.

4.6. The effectiveness of the prevention system

The collected data shows serious damage affected part of the sample where two persons were blinded and 29 persons died. These are equivalent to 7.5% of the collected people’s sample, excluding unforeseen long-term damage, putting the issue of a prevention system at the forefront.
4.7. Poisoning map
The results of the analysis offer a general observation, but a larger sample is required to draw real criteria on this health topic, such as poisoning in another third world country where the society is characterized by a modest cultural level and social diversity.

The main data shows that poisoning incidents occurred on a general scale by order of occurrence as follows: food, alcohol, drugs, coal oil derivatives, pesticides, and animal toxins. Secondly, the highest frequencies of incidents have been for the ages of 19 to 35 years old. Thirdly, the probability of poisoning is relatively equal between males and females, but males tend to suffer more from alcohol poisoning while food and insecticide poisoning affect females more. Nevertheless, the frequency of poisoning changed by geographical areas which varied by poisoning sources, gender, age, or social profile.

Foremost, Zone A had the appropriate distinction of being representative of the poisoning distribution overall in all poisoning terms.

In Zone B, known as an agricultural area and distinguished by vineyards, people are in the habit of consuming alcohol frequently. In addition to that, there is an oil refinery, which explains the slightly higher coal oil poisoning for males rather than females in this area. Meanwhile, the distribution in terms of sources is symmetrical with some preference to alcohol where males suffer highly, and the range of age that is more affected here is those between 11 and 45 years with the highest percentages to young adults especially students. Moreover, the agricultural activity and the presence of an oil refinery had the highest percentages for insecticide and chemical poisoning.

In Zone (C), the coastal and tourist area where fresh fish consumption is a part of people’s daily routine, the consumption of poisoned, infected, or damaged fish could be the source of food poisoning. Meanwhile, the frequency of poisoning incidents is larger for females rather than males. Food poisoning affects females more and the age groups of 19 to 35 years old exceed that of the overall scale, with postgraduates, graduates, and students surpassing other profiles.

Regarding Zone (D), known as a rural area with a high rate of illiteracy along with the dominance of the patriarchal system, it is an area where many petroleum refineries are located. The data analysis shows a double modal frequency of poisoning in this zone. The coal oil derivatives and animal toxins are relatively ahead of other poisonings with a clear similarity to the general distribution of poisoning incidents for different age ranges. As for professions and educational levels, the frequency is symmetrical for most profiles except postgraduate and graduate people. Children are the victims of animal toxins more than farmers are.

5. Conclusion
The study of daily poisoning data, collected from emergency services located in different geographical areas in Syria, has proven the fundamental relationship between the medical and clinical description of poisoning cases and the social indicators of the individuals. Meanwhile, a wider and more detailed survey would offer advanced results able to develop results and show the most dominant daily poisoning tendencies at a national and local level.

The analysis of poisoning incidences by a simple statistical method showed that the characteristics of poisoning vary according to the specificities of each geographical zone. It also showed the ability to detect phenomena associated with non-quantitative interdependent indicators such as components of social identity.

The development of a daily detailed recording system of poisoning incidences in form of a database allows for a better description of the relationship and the dependency of the daily poisoning with the social and economic disparity across the national area. This helps to develop
the medical knowledge concerning the poisoning incidences. Consequently, the prevention and health care system along with laws and regulations are required.

Meanwhile, in a society suffering because of great difficulties in human development, the subject of daily poisoning incidents is important. Therefore, this health matter requires the development of a system to treat daily poisonings from a purely therapeutic point of view that integrates the medical, social, and cultural perspectives in treatment management.

Funding
This work was supported by the No Funder [0].

Author details
Sophie Barguil
E-mail: sophie.barguil@hotmail.com
ORCID ID: http://orcid.org/0000-0003-0487-9641
Faculty of Pharmacy, Damascus University, Syria.

Cover Image
Source:

Citation information
Cite this article as: Mapping the probable daily poisoning incidents according to the individuals demographics, Sophie Barguil, Cogent Social Sciences (2019), 5: 1571729.

References
Attazagharti, N. A., Soulajmeni, A. L., Ouami, L. A., Mohktari, A. B. R., & Soulajmeni, B. (2009). Intoxications médicamenteuses et facteurs de risque influant l’évolution des patients. Antrapo, 19, 33–39.

Barguil, S. (2015). Alcohol poisoning by al Arak household produced and the necessity to apply the control system. Damascus University Journal of Pharmaceutical Sciences, 31(1), 157–168. ISSN 1683-0360.

Barguil, S., Al Zamel, H., Bayone, S. Z., Bitar, F., Tuffaha, R., Terkawi, Y., & Al Raies, Z. (2010). Statistical study of methanol levels in some alcoholic beverages (Scientific Graduation Report). Kalamoon University, Syria.

Bertin, G., & Averbeck, D. (2006, November). Cadmium: Cellular effects, modifications of biomolecules, modulation of DNA repair and genotoxic consequences (a review). Biochimie, 88(11), 1549–1559. Source Epub. doi:10.1016/j.biochi.2006.10.001

Bourdillon, F., Brucker, G., & Tabuteau, D. (2016). Traité de Santé Publique: Prévention et promotion de la santé (3ème édition Médecine-Sciences, Lavoiser MSP, Paris).

Braggio, J. T., Cadoret, K., Fletcher, A., & Allen, J. (2003). Polygon risk score and geographic information system used to display children’s residential geographic polygons that differ on lead risk. Oklahoma: Oklahoma State Department of Health.

Center for disease control and prevention. (2004). Report: Using GIS to assess and direct childhood lead poisoning prevention. USA: CDC, Public Health Research.

Ishido, M., Hornma, S. T., Leung, P. S., & Tohyama, C. (1995). Cadmium-induced DNA fragmentation is inhibitable by zinc in porcine kidney LLC-PK1 cells.

Life Sciences, 56, 351–356. doi:10.1016/0024-3205(95)00100-X

Kim, D. Y., Staley, F., Curtis, G., & Buchana, S. (2002). Relation between housing age, housing value, and childhood blood lead levels in children in Jefferson County, Ky. American Journal of Public Health, 92, 769–770. Source: PubMed. doi:10.2105/ AJPH.92.5.769

Kozumi, T., Li, Z. G., & Tatsumoto, H. (1992). DNA damaging activity of cadmium in Leydig cells, a target cell population for cadmium carcinogenesis in the rat testis. Toxicology Letter, 63(2), 211–220. doi:10.1016/0378-4274(92)90013-A

Michigan Department of community health. (2016). Report: A profile of drug overdose deaths using the Michigan automated prescription system MAPS, Office of recovery-oriented systems of care. Michigan, MI.

Palus, J., Rydzynski, K., Dziubaltowska, E., Wyszynska, K., Natarajan, A. T., & Nilsson, R. (2003). Genotoxic effects of occupational exposure to lead and cadmium. Mutation Research, 540(1), 19–28. doi:10.1016/S1383-5718(03)00167-0

Reissman, D. R., Reissman, D. B., Staley, F., Curtis, G. B., Kaufmann, R. B., Staley, F., ... Kauffman, R. B. (2001). Use of geographic information system technology to aid health department decision, making about childhood lead poisoning prevention activities. Environmental Health Perspectives, 109, 89–94. Source: PubMed. doi:10.1289/ehp.0110989

Roberts, J. R., Hulsey, T. C., Curtis, G. B., & Reigart, J. R. (2003). Using geographic information systems to assess risk for elevated BLLs in children. Public Health Reports, 118, 221–229. doi:10.1016/S0033-3549(04)50243-1

Scherer, C. (2004). Prévention des accidents chez les enfants jusqu’a 16 ans (bpa-Bureau de prévention des accidents Laupenstrasse Berne) ed. Switzerland.

Sidibe, T., Kone, M., Keita, M., Coulibaly, M., & Achourbecova, L. (1991). L’Intoxication Accidentelle Chez l’Enfant. Bilan de 36 mois de service de pédiatrie de l’hôpital Gabriel Toure. Médecine d’Afrique Noire, 38, 2.

Statistical Indicators and National Accounts Statistics. n. d. State Planning Commission, Central Bureau of Statistics (CBS), Statistical Series. 2009 and 2010. Syria.

World Health Organization (WHO). (2004). International programme on chemical safety exposures. Geneva, Switzerland: Education and public awareness activities.

World Health Organization (WHO). (1997). Guidelines for poisoning control. Geneva, Switzerland.
