

# The Life and Works of André-Michel Guerry, Revisited

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## Abstract

André-Michel Guerry was born and raised in Tours in a family whose touraine roots go back at least to the early 1600s. He can be considered one of the founders of the empirical study of criminology and modern social science. His accomplishments were honored in his lifetime, yet he remains largely unrecognized and under-appreciated today, both in history and in his native city. This article traces his life and the contributions he made to social science, thematic cartography and statistical graphics. Moreover, we provide an account of his family background and genealogy. The present article is an expanded update to one written 15 years ago and includes some commentary on the priority dispute between Quetelet and Guerry.

## Key words:

moral statistics; crime mapping; history of social science; Quetelet; thematic cartography

## Prelude

This essay began with my studies of the contributions of André-Michel Guerry to social science, criminology, and the graphic representation of social statistics, embodied first in his 1833 *Essai sur la Statistique Morale de la France*. In my initial article (Friendly, 2007), for a statistical audience, I traced the background of this work, his later 1864 work, *Statistique Morale de l'Angleterre Comparée avec la Statistique Morale de la France*, and how his data and insights could be better appreciated by analyses and graphs from a modern perspective.

However, though I knew Guerry's work, I was surprised to find so little about him as a man, his family history, his reputation in scientific circles, and so forth. An opportunity to study this in further detail arose later in that year when I contacted Jacques Borowczyk, a retired mathematician in Tours who introduced me to the local archives and much more. The result was a paper, "*The Life and Works of André-Michel Guerry*", read to the Académie de Touraine on Feb. 8, 2008 and published in the *Mémoires de l'Académie de Touraine*.

Nearly 15 years have passed, and I have learned more details of Guerry's life and accomplishments, so perhaps it is time for a fuller reappraisal. This essay borrows liberally from my previous work and other scholars of the topics I have re-read with a view to a more general appreciation.

## Introduction

In the history of science, it is not often that events occur that become turning points or give rise to entirely new fields of study. When this happens, the author of such a work is typically widely recognized in his or her lifetime. Later, these accomplishments typically become renown in the communities of scholars and historians; they are also honored in the person's place of birth with the naming of a street or school or the placement of a wall-plaque. Unfortunately, history is sometimes unkind, particularly when the author is not well-connected in the social and academic establishments, or is someone of modest ambition and demeanor, or is over-shadowed by a well-connected, ambitious contemporary.

Such is the case with André-Michel Guerry, born in Tours in 1802. Guerry can be considered as the founder (or at least co-founder, together with the Belgian, Adolphe Quetelet (1796-1874)) of the scientific study of criminology and ultimately modern sociology and social science. Yet, for the reasons mentioned above, the histories of social science accord great honor to Quetelet, while Guerry is often mentioned just briefly or in footnotes and seems unrecognized in his home city.

The 'turning point' event to which I refer above occurred on July 2, 1832, when Guerry, a 29-year-old lawyer, presented a slim manuscript to the Académie Française des Sciences titled *Essai sur la Statistique Morale de la France*. His findings, regarding crime, suicide and other moral aspects, were both startling and compelling. His presentation, in tables and *cartes figuratives*, showed that the rates of crime and suicide remained remarkably stable over time, when broken down by age, sex, region of France and even month or season of the year; yet these numbers also varied systematically across departments of France. This regularity and variation of 'social numbers' created the possibility to conceive, for the first time, that human actions in the social world were governed by social laws, just as inanimate objects were governed by laws of the physical world. His results were startling because they contradicted some widespread beliefs about the nature and causes of crime and its relation to other factors such as education and poverty. To social thinkers in the 1830s in France, with widespread political and social upheaval and a fear of crime heightened by the press and popular writers (Chevalier, 1958), Guerry provided powerful demonstrations that answers to social questions could be provided by a new science rather than philosophy.

Until my work in 2007, very little of Guerry's personal life had been known. The primary sources are the necrology by Alfred Maury and notices on his work by Hypolyte Diard and Ernest Vinet published collectively in Diard (1867) and brief biographies published in *the Grand Dictionnaire Universel* (Larousse, 1866), Vapereau (1858), and Carré de Busserolle (1880).

One purpose of this article is to describe the life and family background of André-Michel Guerry in more detail than has ever been recorded. We can now trace his family and that of his cousin, André-René Poisson [1808-1875], who will figure later in this story, back at least six generations. In addition, we provide a detailed overview of his work and accomplishments, for which he deserves wider recognition. A more complete, modern appreciation of his contributions to social statistics and data visualization was provided by Friendly (2007). A companion website to that article (<https://www.datavis.ca/gallery/guerry/>) provides links to further information and some high-resolution images. A secondary purpose is to add some additional detail on Guerry's other work and the priority dispute with Quetelet.

## Guerry's Life

André-Michel Guerry was born in Tours in the parish of Saint-Martin on December 24, 1802 (3 Nivôse XI in the Republican calendar) , a pre-Christmas present to his parents, Michel Guerry and Catherine Thérèse Bouquin. His birth certificate (from the Archives of Tours) records that his father was a building contractor (entrepreneur de travaux publics) and that the family resided in Tours at rue Corneille n° 62 (after 1816, that became rue Bernard-Palissy). As far as can be determined, he was their only child (no other birth or christening records relating to his parents have been found) and his family circumstances were comfortable, though modest. About 1817-1820 he studied at the communal secondary school (founded 16 Feb. 1807 by Napoleon, which became the collège impérial de Tours in 1830, and is now the lycée Descartes) and was regarded by his peers as a serious student.<sup>1</sup>

He then studied law at the University of Poitiers, and perhaps also literature and physiology; he went to Paris where he was admitted to the bar as a Royal Advocat. In 1825, the Ministry of Justice instituted the first centralized national system of crime reporting, *the Compte général de l'administration de la justice criminelle en France*, an event that would define Guerry's professional life.

The *Compte général* was based on records collected quarterly from each department giving the details of every criminal charge laid before the French courts: age, sex, occupation of the accused, nature of the crime, etc. Guerry was employed at the Ministry of Justice and in 1827 was required to compile the data on crimes for Paris. He became so captivated by these data and the possibility to discover empirical laws that govern social behavior that he quickly abandoned the practice of law to devote himself to the study and interpretation of moral statistics from this and other sources.

Guerry served initially under Jacques de Guerry de Champneuf [1788-1852], appointed Director of Criminal Affairs and Pardons in the Ministry of Justice on August 16, 1821 by Count d' Peyronnet. But after the abdication of King Charles X in the July 1830 revolution, Guerry de Champneuf was removed from office (along with many other public officials), and Guerry himself was appointed Director of Criminal Statistics in the reorganization in that year.<sup>2</sup>

Why was Guerry appointed to succeed his former boss? There is scant evidence regarding Guerry's political views on constitutional monarchy and his intellectual connections inside and out of the Ministry; but from what is known of his character, it is fair to say that he was apolitical and not regarded as a threat to either the liberal or conservative factions. There is also evidence (Isambert, 1969) that Guerry was well-connected to the leading figures of proto-statisticians: Louis-René Villermé [1782-1863], Baron Charles Dupin [1784--1873], Adolphe d'Angeville [1796--1856] in the Société de Statistique de Paris and the group surrounding the *Annales d'Hygiène Publique et de Médecine Légale*.

Shortly before his first major work, at age 27, he published his first work on moral statistics (Balbi & Guerry, 1829), with the Venetian geographer Adriano Balbi [1782-1848]. This was a large one-

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<sup>1</sup> Diard (1867, p.8): « Il était enfant de la Touraine, et tous ses condisciples ont gardé le souvenir des habitudes sérieuses de sa jeunesse. Son goût pour la statistique s'est manifesté sur les bancs de l'école. »

<sup>2</sup> The similarity of their names has caused some writers to conclude that Guerry and Guerry de Champneuf were related, but this is now known to be an error (Whitt, 2002, p. xxii).

page set of maps of France comparing the level of education in the departments of France with those of crimes against persons and property (see Figure 1) For reasons I discuss below, this would be the first of several important contributions to moral statistics by Guerry and set a pattern for visual analysis he would later follow.

In these early years, Guerry had many wide-ranging interests, including music, folklore, medicine and meteorology. In 1830 he published « Sur les anciens chants populaires de Poitou » in the *Mémoires de la Société des Antiquaires de France* containing musical notations of these songs. Over the next few years, he published several works on relations among phenomena of weather and season, and mortality from different diseases or characteristics of persons confined to insane asylums and prisons.

By 1832, at age 29, Guerry completed the draft of his manuscript, *Essai sur la statistique morale de la France*, which he presented to the Académie Française. The Essai was awarded the prestigious Prix Montyon and published by the Académie in 1833 with a laudatory report by the committee that had recommended him for the prize. Within a short period of time, this work attracted considerable attention in European statistical circles. Guerry was elected corresponding member of the Académie des Sciences Morales et Politiques and subsequently awarded the cross of chevalier of the Legion of Honor. Of particular interest was a series of 6 beautiful, shaded maps that showed the distribution of crimes against persons and against property, suicide, education, children born out of wedlock (enfants naturels) and donations to the poor over the departments of France.

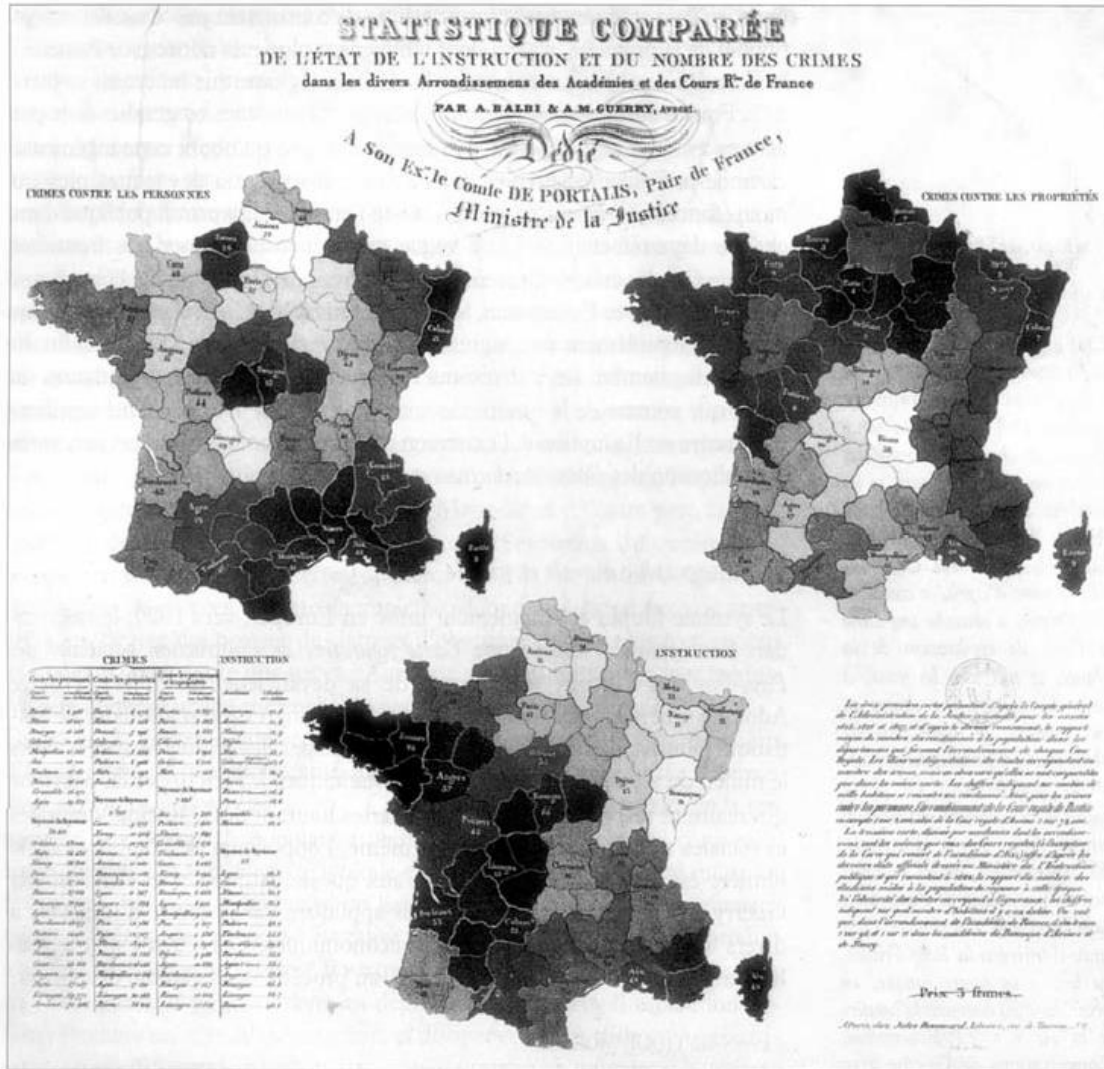


Figure 1: Balbi & Guerry's 1829 comparative maps of crime and instruction. Top left: crimes against persons; top right: crimes against property; bottom: instruction. In each map, the departments are shaded so that darker is worse (more crime or less education). The legend at the lower left gives the data on which the maps were based. Source: Courtesy BNF.

By most accounts, Guerry's fame rests with the *Essai*. But he also deserves to be recognized, perhaps more so, for his final and most ambitious work, *Statistique morale de l'Angleterre comparée avec la statistique morale de la France*, which appeared in print in Guerry (1864). This magnificent volume was published in grand format (about 56 x 39 cm., the size of a coffee table). It contained 17 plates: 15 shaded maps of England and France on aspects of crime (personal crime, property crime, murder, rape, larceny, arson), education and suicide, and two complex tableaux graphiques, summarizing the distribution and trends in these two countries over 30 years. This work had been crowned by the Académie in 1860, and Guerry was again awarded the Prix Montyon the following year.

In the 30 years between these works, Guerry displayed his maps and charts in several expositions in Europe. In 1851, he had two exhibitions—an honored public one in the Crystal Palace at the London Exhibition and a second one at the British Association for the Advancement of Science (BAAS) in Bath, England. He had earlier gained access to court records for England with the help of William Farr [1807-

1883], president of the British Association, and also the chief statistician of the General Registrar's Office. This work was deemed sufficiently important that Farr recruited a Mr. Redgrave in the Home Office to provide assistance. During this time, Guerry worked tirelessly, compiling and summarizing the voluminous records of crime and other moral variables for England and France. Along the way, he invented a mechanical device, the *ordonnateur statistique*, to help with these tabulations.<sup>3</sup> One cannot fail to be impressed by the sheer volume of data summarized in this work; it includes, for example, 226,000 cases of personal crime in the two countries over 25 years and over 85,000 suicide records, each classified by apparent motive and other circumstances. Guerry estimated that if all his numbers were written down in a line, they would stretch over 1170 meters!

In October of 1864, Guerry, who had been made an honorary member of the Statistical Society of London, was again invited by Farr to attend the BAAS meetings in Bath. *The Statistique Morale de l'Angleterre...* and its splendid plates were put on public display for the nearly 2800 members who attended and became the subject of a commentary by W. Heywood, vice-president of the Society.

The following August, while consulting the archives of the Hôtel de Ville in Paris, Guerry suffered a stroke. He survived, but grew progressively weaker, and died on April 9, 1866. His childhood friend, Alfred Maury, gave the funeral oration (published in Diard, 1967) and said,

*André-Michel Guerry succumbed to the rigors of his hard work. He sacrificed his health, compromised his fortune, used his life for the advancement of a science on which he laid the first and most solid foundations.*

From this brief biographical sketch, the reader may see that we know quite a lot about Guerry's professional and work life, but relatively less about his personal life. Where did he live in Paris? Who were his friends? Where was he buried?

The first clue came in Sept. 2012 when Michel Moser, an amateur historian in Beaumont-sur-Dême (not far from Tours) learned of my interest in Guerry. He informed me that Guerry moved from Paris to Beaumont and served as mayor of this small town from 1846—1855; he owned and lived in the Priory Vauban.<sup>4</sup>

Further research led to Guerry's death notice<sup>5</sup>. This gives his death on April 9, 1866, at his residence, 123 Boul. St. Michel in the 5<sup>ème</sup> arrondissement of Paris. It also indicates that he was not married, and the witnesses were his cousins, André René Poisson and Pierre Vaslin.

From this information, my colleagues and I (Friendly & les Chevaliers, 2020) determined that Guerry was buried in Montparnasse Cemetery, in Section 9, 3<sup>rd</sup> row South, the 18<sup>th</sup> grave, at GPS coordinates

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<sup>3</sup> Maury (1864, p5) says the machine was offered by Guerry's heirs to the Conservatoire des Arts et Métiers in Paris. Friendly and Saint Agathe (2012) trace the history of this device, which unfortunately vanished during renovations, sometime before 1988.

<sup>4</sup> The details are described at <https://moserm.free.fr/beaumont/bio3.html>. Among Guerry's Beaumont neighbors, Alexis de Tocqueville wrote "Democracy in America" in 1833.

<sup>5</sup> See: <https://moserm.free.fr/beaumont/acte3.html>. A transcription and English translation appears at <https://datavis.ca/papers/Guerry-death-notice.pdf>.



48.83731°N 2.324875°E (Figure 2). We had earlier discovered that Charles Joseph Minard, author of some of the most impressive graphics works of all time, had lived nearby, at 32 rue du Bac in the 5<sup>eme</sup> and was also buried in Montparnasse. Thus, Guerry was a near neighbor of Minard, both in life and death (Friendly et al. 2020). We know that Minard was impressed with Guerry's work and reproduced the Balbi & Guerry (1829) shaded maps showing crime and literacy in France in his 1861 treatise, *Des tableaux graphiques et des cartes figuratives*.<sup>6</sup> Émile Durkheim [1858–1917] was also buried in Montparnasse.



Figure 2: Detail of the SW corner of Montparnasse Cemetery showing the burial sites of Charles Joesph Minard and André Michel Guerry. Numbers on the map show the section numbers in the cemetery. Source: Author graphic, annotated from Géoportail, [www.geoportail.gouv.fr](http://www.geoportail.gouv.fr)

## Guerry's Family

As I noted earlier, Guerry's family history had been completely unknown until the research that prompted my original article. From his birth certificate, we learned the names of his parents, Michel Guerry [1761--1830] and Catherine Thérèse Bouquin [1761--1842], and also that the first witness was his

<sup>6</sup> Translated and illustrated by R. J. Andrews, <https://infowetrust.com/project/minard1861>

cousin, André Poisson, occupation tanner, residing in Amboise, 25 km east of Tours. The only published personal information (Diard, 1867, p.14-15) mentioned André and Charles Poisson as his heirs:

*Among the papers left by Mr. Guerry, offered by his heirs, MM. Charles and André Poisson, at the Société des sciences, arts et belles-lettres d'Indre-et-Loire, and analyzed before this Company by Mr. Diard, was a bundle containing papers that Mr. Guerry had classified, and that he obviously intended to keep.*

This footnote becomes important in connection with Guerry's work, described in a later section, but it was also a key source in tracing his family history. The genealogical information detailed below comes from a variety of sources, including the Centre généalogique de Touraine (2002), Bordat (1989), l'Arbre Généalogique de Olivier Dibios (<https://gw.geneanet.org/dibos>), and local archives and church records in and around Tours (discovered by Borowczyk).

André-Michel Guerry was the only known child born to his parents. He never married and had no children, so his direct lineage ended with him. However, from the sources just mentioned, it has been possible to trace his family back to the early 1600s on his father's side and to the early 1700s on his mother's side. An ancestry chart for André- Michel Guerry is shown in Figure 3.

Guerry's father, Michel Guerry [1761--1830], was born in Neuillé-Pont-Pierre, where his father, Michel Guerry (about 1718-1783+) was the aubergiste of La Roue, an inn and waystation for travelers and the mail (relais de poste aux chevaux) near the intersection of the routes from Tours to Mans and from Blois to Angers. The occupation of the Guerry family as innkeepers of La Roue in Neuillé-Pont-Pierre goes back at least two more generations to Louis Guerry [1645--1696]. Going back two more generations in Neuillé-Pont-Pierre takes us first to Hector Guerry [1622--?] and finally to Etienne Guerry [1590--?] who is recorded as a grand valet du roi to King Louis XIII, perhaps also a member of the Royal Council.

Among the other ancestors of André-Michel Guerry, most resided in and around Neuillé- Pont-Pierre and made their living as farmers, millers and merchants or the family business, La Roue. But his father, Michel Guerry apparently wished for a different life and moved to Tours with his wife Catherine Thérèse Bouquin, daughter of the gardener Jean Bouquin. In Tours he was apparently quite successful as a civil contractor, for he was able to afford to send his son, André-Michel to the local secondary school and then to university. It is likely that André-Michel was the first in his family to attend a university or perhaps even a college-royale.





Neuillé-Pont-Pierre in various years from 1825-1840. His brother Charles served as justice of the peace in Neuillé-Pont-Pierre over this same period.

The genealogical information we have discovered so far about the families of Guerry and Poisson ends with André-Michel Guerry and André René Poisson who married Marie-Françoise Vaslin (children unknown). La Roue continued to be maintained by the families of Poisson and Cormery; at some point it became the Hotel Sainte-Barbe. We have been unable to uncover any further details about l'hôtel Sainte-Barbe.

The main clues we have now about the future of these families come from Bordat (1989) and an examination of the cemetery in Neuillé-Pont-Pierre. There we find, among the soldiers killed in battle in World War I, Henri Pierre Guerry [1893—1915], Marcel René Poisson [1885—1915], killed in Alsace, and Georges Paul Alexandre Poisson [1896—1917].

## Guerry's Work

In this section I describe some further details and examples of Guerry's work in order to extend the biographical sketch presented earlier. In particular, I try to illustrate Guerry's contributions, to social science and also to cartography and statistical graphics. His published works were relatively few, but all were significant developments that deserve to be recognized as milestones in the histories of these fields. The portrait I would like to convey is that of a dedicated and creative amateur (in the best sense of the word) statistician, working at a time when real quantitative data on crime and social issues was entirely new, as was the very idea of showing such data on charts and maps. In this work, he consistently sought to go beyond mere **description** of individual phenomena, but rather to understand the **relations** among factors that affected, and might explain, human behavior in the social and moral realms.

In passing and for context, it is useful to briefly mention the intellectual milieu in which Guerry worked in the first half of the 19<sup>th</sup> century. Isambert (1969) points to three orientations of French thinkers who contributed to early sociology and the study of criminal and moral statistics: (a) social philosophers and theoreticians of society, such as Henri Saint-Simon and Auguste Comte (who coined the term "social physics"); (b) mathematicians, including Pierre-Simon Laplace, Nicolas de Condorcet, Augustin Cournot, who sought to apply the calculus of probability to the understanding of human society; (c) proto-statisticians, who include hygienists like Louis René Villermé, economists like Charles Dupin and of course, Guerry. Lécuyer (1987) details the rise of statistics as practical tools for understanding society and the political climate in France following the Bourbon Restoration. A full history of the rise of criminology as a scientific discipline is told in Beirne's (1993) *Inventing Criminology*.

Guerry's earliest statistical and graphic work examined the relation between weather and seasonal phenomena on the one hand, and admission to hospitals and mortality from various diseases on the other (Guerry, 1829), based on 8-10 years of observations from the Royal Observatory, the central bureau of hospitals in Paris, and other sources. Included here was a remarkable set of 26 charts in a large *tableau graphique* showing monthly temperature, days of rain, snow, fog, sunshine, etc., to be

compared with similar charts of causes of hospital admission, and also births, deaths, marriages and even suicides.

His goal here was to try to determine if relationships among meteorological variation and physiological phenomena could be found by graphical means; but particularly to show how these could be represented as cyclical phenomena, over months of the year, hours of the day, days of the week and so forth. Weather phenomena included wind direction, temperature, days of thunder, frost, rain, snow, etc. Physiological phenomena were comprised of various causes of admission to hospital. He also included data on weddings, mortality, suicides by month, and hourly data on births and deaths.

Figure 4 shows the portion of his diagram using the radial wedge form to show average trends for some periodic phenomena at different scales; he called these “courbes circulaires,” meaning he saw them as curves wrapped around a circle. The top row here shows average wind directions for four quarters of the year, using the conventional compass orientations. He says:

*We have represented by these circular areas, and from the observations of 9 years, the number of days that the various winds blow in Paris during a three-month period. ... According to popular opinion, the south winds prevail especially in summer, northerly winds in winter. We see that the exact opposite is happening.*

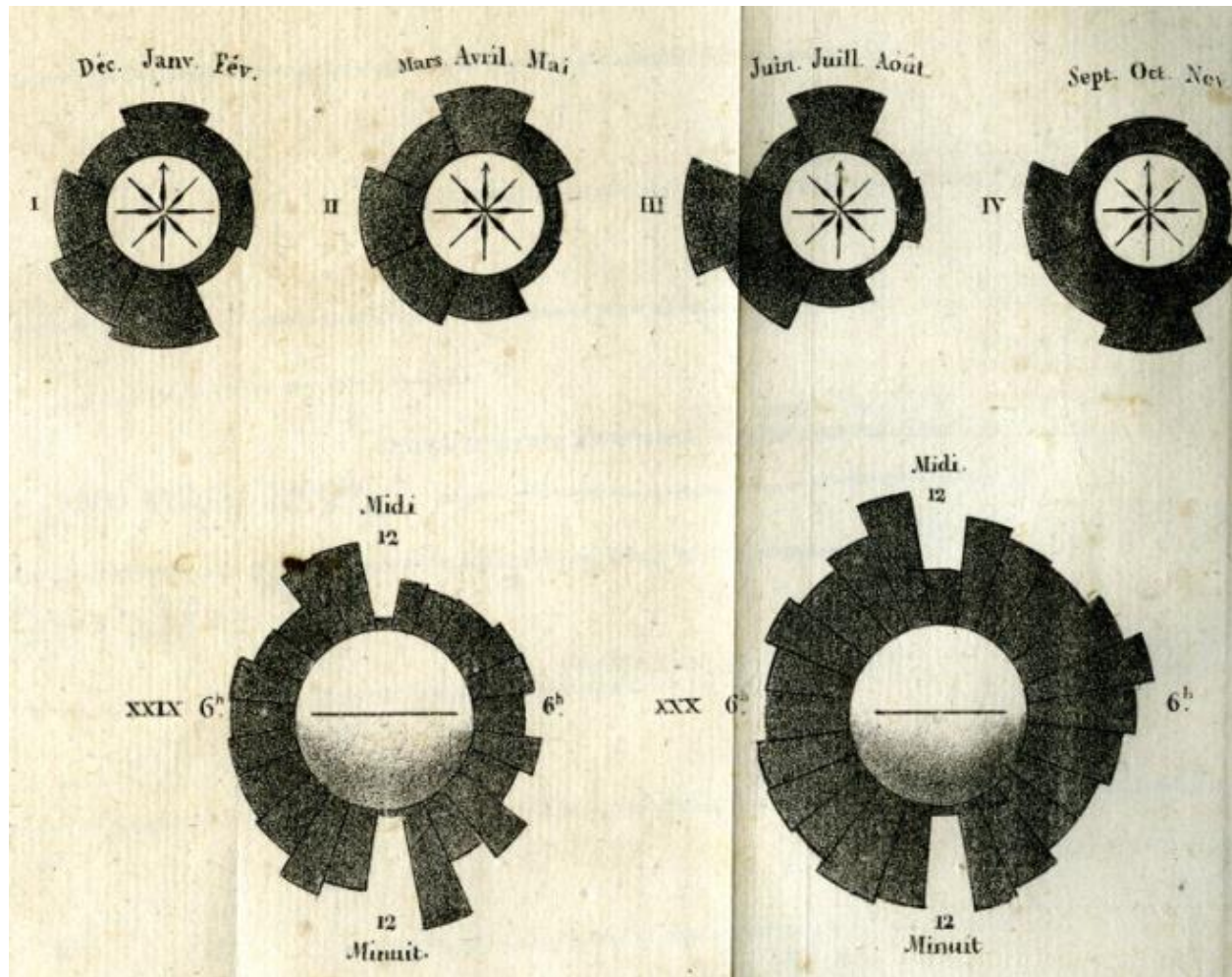


Figure 4: Guerry's radial charts of cyclical phenomena. The top row, charts I. – IV. Show the averages of prevailing wind direction by circular area over 9 years according to compass directions. The bottom row, charts XXIX and XXX show, respectively the number of births and deaths over hours of the day. Source: Guerry (1829).

This establishes his idea that diagrams of cyclical phenomena can reveal consistencies not easily seen in tables. Graphical methods were still on the rise in 1829. To cite an authority, and frame his study in a wider context, he quotes von Humboldt's (1817) memoir on finding lines of isotherms:

*The use of graphic means will throw a lot of light on phenomena of the highest interest. If, instead of geographical maps, we had only latitude, longitude and height coordinates, a large number of curious relationships offered by the configuration and inequality of the continents would have remained forever unknown.*

The invention of this novel graphic display using radial diagrams should be attributed to Guerry, but it is universally credited to Florence Nightingale (1857), who used the same design to compare the patterns of deaths in the British army in the Crimean War from actual battle vs. other, preventable causes, and argue for improved hospital conditions in the army. As far as we are aware, Guerry's "courbes circulaires" represent the first general statement of the graphical principle of radial diagrams for cyclical phenomena, using wedges of constant angle and varying radius (Friendly & Andrews, 2022).



## Guerry and Balbi

Also in 1829, Guerry published *Statistique comparée de l'état de l'instruction et du nombre des crimes...*, with Adriano Balbi (Balbi & Guerry, 1829), the first graphic work on what would later be called *statistique morale*, shown in Figure 1<sup>7</sup>. Only two years before, the very idea of showing statistical, non-geographic information on a map by shading (now called a choropleth map) had been invented in France by Baron Charles Dupin<sup>8</sup>.

Guerry wanted to compare rates of crime with the level of instruction across France, to see whether, as some social thinkers had suggested, increased education was associated with lower crime. Rather than drawing separate maps, he and Balbi composed three maps on a single sheet, showing crimes against persons, crimes against property and level of instruction for each department.<sup>9</sup> They were far ahead of their time, because this technique, “small multiples” (Tufte, 1983), allowing direct comparison, is a modern addition to data graphics.

The maps in Figure 1 were quite jarring to both the liberal and conservative camps because they went far beyond the ken of rationalist arm-chair philosophy and contradicted parts of each view, confronting philosophy with hard data. They suggested (a) crime against property and against persons seemed inversely related overall, though both tended to be higher in more urban areas; at the very least, one could not speak of “crime” as if it were a single phenomenon. (b) More importantly, there did not seem to be any apparent direct relation of either type of crime to instruction. For example, although the north of France had the highest levels of education, property crime was also high there. This directly countered the causal views of liberal, educationalists who believed that increased schooling should lead to a decrease in crime, as well as those of hard-liners who supported harder prison terms as the solution to crime. As far as is known, there was no text accompanying this map image; however, even today it stands out as a fine example of graphic design and visual explanation.

Moreover, another surprising feature became apparent in his map of instruction: A clear demarcation could be seen along a diagonal line from Brittany to Geneva, separating the less educated south of France from the more educated north. This sharp cleavage, between *France obscure* versus *France éclairée*<sup>10</sup> became reified as the “Saint-Malmo – Geneva line” and continued to generate much debate about the social causes and circumstances through the end of the 19<sup>th</sup> century; it still arises today. Tell a hotelier in Paris you are going to the South of France, and she is likely to advise you to watch your wallet.

This graphic invention (starting with Dupin) — the first modern statistical map— was the starting point of a true graphical revolution that Guerry would extend to a more general social cartography with the

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<sup>7</sup> See <https://datavis.ca/gallery/images/guerry/guerry-balbi-600s.jpg> for a higher- resolution version.

<sup>8</sup> Dupin (1827) used this to illustrate the effects of popular education on France’s prosperity, by shading each department lighter in proportion to the number of young people who attended schools.

<sup>9</sup> The data on crime were combined with data from the census to give measures of population per crime; the data on instruction were based on the number of male children in primary schools, also in the form of inhabitants per student.

<sup>10</sup> This distinction and the coined phrase were first noted by Conrad Malte-Brun in 1823 from inspection of Balbi’s (1821) tables, *Journal des Débats*, 21 Jul 1823, p. 3–4.

comparative analysis social issues. The legacy of this revolution is commonplace today, in maps of disease incidence, poverty, child mortality, income distribution, COVID and so forth (Friendly and Palsky, 2007; Koch, 2000).

Little is known of Adriano Balbi, except that he began as a professor of geography in Murano and later became a professor of physics. In 1820, he visited Portugal and began work on studies of physical and social geography. The following year he moved to Paris and published the *Essai statistique sur le royaume de Portugal et d'Algarve* (Balbi, 1821); shortly after he published an ethnographic atlas of the world and several other works. It was in this period that he encountered Guerry and several others, including Conrad Malte-Brun (founder of the first modern geographical society) interested in geographic studies of social phenomena.

### Guerry(1833): *Essai sur la Statistique Morale de la France*

The Balbi-Guerry collaboration was the start of the passionate work on moral statistics that consumed Guerry for the rest of his working life. Over the next three years Guerry occupied himself with the extension and refinement of these initial results, with extensive tabulation of new data from diverse sources, and with answers to methodological questions that might lead to challenges to his conclusions.

On the methodological side, he discussed how these measures should be defined to ensure comparability across France and what we now term validity of the indicators used. For education, for example, he considered the reported levels of instruction (number of male children in primary school) to be suspect due to variations in local reporting; after 1827, better and more uniform data became available from the Ministry of War, whose exams for new recruits gave numbers for those who could read and write (Guerry, 1832b).

A second major question he addressed was whether crimes should be counted by the number of indictments (*accusés*) or by the number of convictions (*condamnés*). Here, he argued persuasively that the number of indictments was a more useful indicator of the number of crimes committed because it is less likely to be influenced by the factors that affect juries: the nature of the crime, severity of punishment and the place where the accused is judged. Moreover, although an indictment by no means implies the guilt of the accused, it does reasonably imply that a crime was committed; conversely, a person might be acquitted for a variety of reasons, but that does not mean that a crime did not take place.

### Social Laws: Stability and Variation

His initial method was simple: he tabulated the relative frequencies (percentages) of crime and suicide, broken down by geographic region, age, sex, type of crime or method of suicide, and month or season of the year, for each year of available data from 1826—1830. Some sample results are shown in Figure 5 and Figure 6.

| Year    | 1825                        | 1826 | 1827 | 1828 | 1829 | 1830 | Avg |
|---------|-----------------------------|------|------|------|------|------|-----|
| Region  | Crimes against property (%) |      |      |      |      |      |     |
| North   | 41                          | 42   | 42   | 43   | 44   | 44   | 42  |
| West    | 17                          | 19   | 19   | 17   | 17   | 17   | 18  |
| East    | 18                          | 16   | 17   | 16   | 14   | 15   | 16  |
| Central | 12                          | 12   | 11   | 12   | 13   | 13   | 13  |
| South   | 12                          | 11   | 11   | 12   | 12   | 11   | 12  |
| Total   | 100                         | 100  | 100  | 100  | 100  | 100  | 100 |

Figure 5: Table reproduced from Guerry (1833, p. 10; Whitt & Reinking, 2002, p. 13) showing percentages of crimes against property by year and region of France.

| Year              | 1826                    | 1827 | 1828 | 1829 | 1830 | Avg |
|-------------------|-------------------------|------|------|------|------|-----|
| Sex               | All accused (%)         |      |      |      |      |     |
| Male              | 79                      | 79   | 78   | 77   | 78   | 78  |
| Female            | 21                      | 21   | 22   | 23   | 22   | 22  |
| Age               | Accused of theft (%)    |      |      |      |      |     |
| 16–25             | 37                      | 35   | 38   | 37   | 37   | 37  |
| 25–35             | 31                      | 32   | 30   | 31   | 32   | 31  |
| Crime             | Committed in summer (%) |      |      |      |      |     |
| Indecent assault  | .                       | 36   | 36   | 35   | 38   | 36  |
| Assault & battery | .                       | 28   | 27   | 27   | 27   | 28  |

Figure 6: Table reproduced from Guerry (1833, p. 11; Whitt & Reinking, 2002, p. 15) showing percentages of crimes classified by several characteristics.

This presentation of his data was immediately compelling, even in table form: the rates of crime (and suicide) remained remarkably stable over time, no matter how broken down, but they varied systematically by region, sex of accused, type of crime, and even season of the year. In any given French department or region, almost the same proportions of inhabitants stole, committed indecent assault, gave birth out of wedlock, and so forth.

This combination of **stability** (over factors that don't matter, like year) and **variation** (over variables that should, like type of crime) gave rise to the idea of the law-like behavior of social facts. These results led Guerry to ask whether crime and other moral variables are simply indicants of individual behavior or whether human actions in the social world are governed by social laws, just as inanimate objects are governed by laws of the physical world. This was a revolutionary idea. He argued:

*“Each year sees the same number of crimes of the same degree reproduced in the same regions. . . . We are forced to recognize that the facts of the moral order are subject, like those of the physical order, to invariable laws” (Guerry, 1833, p. 10, 14).*

In passing, we note that Quetelet (1831) described some similar analyses of data on the propensity to commit crimes based on the same data (from the *Compte générale*) and relating crime to various social factors. This occasioned a priority dispute for the discovery of lawfulness in social data, to which we return in a later section.

### Seeking explanations, causes and relationships

Guerry's 1833 *Essai* contained numerous tables giving breakdowns of crimes against persons and property by characteristics of the accused, frequencies of various subtypes of crime in rank order for both men and women. The most common personal crime for men was assault and battery; for women, it was infanticide, often arising from unwanted pregnancy but abortion was frequently listed as the crime and frequencies of crimes by age groups.

To go beyond simple description, Guerry classified the crimes of poisoning, manslaughter, murder, and arson according to the apparent motive indicated in court records. For instance, in the case of poisoning, the motive was most frequently adultery; for murder, it was hatred or vengeance. This was a crucial step in understanding and explaining criminal behavior. It pointed to the need to study the relations among moral variables in new ways.

In a novel graphic approach to questions of relationships and possible causes, in the 1833 *Essai* Guerry tried to examine how the types of crimes committed varied with age of the accused. To do this, he prepared the ranked lists shown in Figure 7 for crimes against persons sorted from high to low for each age group; a similar display showed rankings for crimes against property by age group.

To make the trends more amenable to visual inspection, he added lines to connect selected crimes horizontally to show the trend. This gives a semi-graphic display that combines a table (showing actual numbers) with the first known instance of a parallel coordinate plot. In the original, the trace lines are hand colored in different light hues to make them visually distinct. This is likely the first use of this combination of ranked lists (now called a "bump chart") showing data values connected by lines to show trends.

Using this display, Guerry discusses a variety of trends, such as the decrease in indecent assault on adults (*viol sur des adultes*) with age, the rise of indecent assault on children to the top for those over 70, and the increase in parricide with age (surprisingly reaching a maximum for "children" aged 60–70).



INFLUENCE DE L'AGE.

DISTRIBUTION DES CRIMES AUX DIFFERENS AGES, PAR PERIODE DE DIX ANNEES.

1V.

| A. CRIMES CONTRE LES PERSONNES. |                              |                           |                              |                          |                              |                          |                              |                          |                              |                          |                              |                          |                              |
|---------------------------------|------------------------------|---------------------------|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------|
| AU-DESSOUS DE 21 ANS.           |                              | DE 21 A 50.               |                              | DE 30 A 40.              |                              | DE 40 A 50.              |                              | DE 50 A 60.              |                              | DE 60 A 70.              |                              | AU-DESSUS DE 70 ANS.     |                              |
| 1                               | NATURE DES CRIMES. Sur 1,000 | 2                         | NATURE DES CRIMES. Sur 1,000 | 3                        | NATURE DES CRIMES. Sur 1,000 | 4                        | NATURE DES CRIMES. Sur 1,000 | 5                        | NATURE DES CRIMES. Sur 1,000 | 6                        | NATURE DES CRIMES. Sur 1,000 | 7                        | NATURE DES CRIMES. Sur 1,000 |
| 1                               | Blessures et coups. 184      | Blessures et coups. 218   | Blessures et coups. 179      | Assassinat. 194          | Meurtre. 185                 | Meurtre. 173             | Viol sur des enfans. 158     | Blessures et coups. 157  | Meurtre. 125                 | Meurtre. 125             | Meurtre. 125                 | Meurtre. 125             | Meurtre. 125                 |
| 2                               | Viol sur des adultes. 169    | Meurtre. 157              | Assassinat. 194              | Blessures et coups. 194  | Assassinat. 182              | Viol sur des enfans. 158 | Blessures et coups. 157      | Meurtre. 125             | Meurtre. 125                 | Meurtre. 125             | Meurtre. 125                 | Meurtre. 125             | Meurtre. 125                 |
| 3                               | Meurtre. 147                 | Assassinat. 149           | Meurtre. 133                 | Meurtre. 133             | Blessures et coups. 142      | Assassinat. 159          | Blessures et coups. 142      | Assassinat. 142          | Assassinat. 142              | Assassinat. 142          | Assassinat. 142              | Assassinat. 142          | Assassinat. 142              |
| 4                               | Viol sur des enfans. 141     | Rebellion. 141            | Rebellion. 140               | Rebellion. 140           | Blessures et coups. 142      | Assassinat. 159          | Blessures et coups. 142      | Assassinat. 142          | Assassinat. 142              | Assassinat. 142          | Assassinat. 142              | Assassinat. 142          | Assassinat. 142              |
| 5                               | Assassinat. 101              | Viol sur des adultes. 105 | Viol sur des adultes. 75     | Viol sur des adultes. 94 | Viol sur des enfans. 68      | Faux témoignage. 98      | Faux témoignage. 102         | Faux témoignage. 102     | Faux témoignage. 102         | Faux témoignage. 102     | Faux témoignage. 102         | Faux témoignage. 102     | Faux témoignage. 102         |
| 6                               | Rebellion. 78                | Infanticide. 83           | Infanticide. 63              | Faux témoignage. 63      | Faux témoignage. 68          | Rebellion. 78            | Rebellion. 91                | Rebellion. 91            | Rebellion. 91                | Rebellion. 91            | Rebellion. 91                | Rebellion. 91            | Rebellion. 91                |
| 7                               | Infanticide. 48              | Viol sur des enfans. 58   | Viol sur des enfans. 59      | Viol sur des adultes. 61 | Viol sur des adultes. 61     | Viol sur des adultes. 61 | Viol sur des adultes. 61     | Viol sur des adultes. 61 | Viol sur des adultes. 61     | Viol sur des adultes. 61 | Viol sur des adultes. 61     | Viol sur des adultes. 61 | Viol sur des adultes. 61     |
| 8                               | Bless. env. ascend. 47       | Bless. env. ascend. 50    | Bless. env. ascend. 41       | Bless. env. ascend. 41   | Infanticide. 41              | Infanticide. 42          | Infanticide. 42              | Infanticide. 42          | Infanticide. 42              | Infanticide. 42          | Infanticide. 42              | Infanticide. 42          | Infanticide. 42              |
| 9                               | Associat. de malfait. 32     | Faux témoignage. 33       | Faux témoignage. 49          | Infanticide. 41          | Empoisonnement. 49           | Empoisonnement. 42       | Empoisonnement. 42           | Empoisonnement. 42       | Empoisonnement. 42           | Empoisonnement. 42       | Empoisonnement. 42           | Empoisonnement. 42       | Empoisonnement. 42           |
| 10                              | Faux témoignage. 29          | Empoisonnement. 32        | Empoisonnement. 25           | Empoisonnement. 25       | Bless. env. ascend. 19       | Associat. de malfait. 21 | Associat. de malfait. 21     | Associat. de malfait. 21 | Associat. de malfait. 21     | Associat. de malfait. 21 | Associat. de malfait. 21     | Associat. de malfait. 21 | Associat. de malfait. 21     |
| 11                              | Empoisonnement. 22           | Crim. env. des enf. 10    | Crim. env. des enf. 16       | Associat. de malfait. 12 | Bigamie. 13                  | Bigamie. 13              | Bigamie. 13                  | Bigamie. 13              | Bigamie. 13                  | Bigamie. 13              | Bigamie. 13                  | Bigamie. 13              | Bigamie. 13                  |
| 12                              | Voies de fait, etc. 8        | Associat. de malfait. 10  | Associat. de malfait. 12     | Associat. de malfait. 12 | Mendicité. 8                 | Mendicité. 7             | Mendicité. 7                 | Mendicité. 7             | Mendicité. 7                 | Mendicité. 7             | Mendicité. 7                 | Mendicité. 7             | Mendicité. 7                 |
| 13                              | Mend. av. violence. 6        | Parricide. 8              | Parricide. 8                 | Mend. av. violence. 8    | Avortement. 7                | Avortement. 7            | Avortement. 7                | Avortement. 7            | Avortement. 7                | Avortement. 7            | Avortement. 7                | Avortement. 7            | Avortement. 7                |
| 14                              | Crim. env. des enf. 5        | Voies de fait, etc. 6     | Mend. av. violence. 8        | Bigamie. 5               | Bigamie. 5                   | Bigamie. 5               | Bigamie. 5                   | Bigamie. 5               | Bigamie. 5                   | Bigamie. 5               | Bigamie. 5                   | Bigamie. 5               | Bigamie. 5                   |
| 15                              | Parricide. 5                 | Avortement. 5             | Avortement. 6                | Avortement. 6            | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        |
| 16                              | Avortement. 5                | Mend. av. violence. 2     | Avortement. 6                | Avortement. 6            | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        |
| 17                              | Bigamie. 5                   | Bigamie. 1                | Voies de fait, etc. 6        | Voies de fait, etc. 6    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        | Voies de fait, etc. 4    | Voies de fait, etc. 4        |
|                                 | Autres crimes. 4             | Autres crimes. 7          | Autres crimes. 12            | Autres crimes. 12        | Autres crimes. 19            | Autres crimes. 26        | Autres crimes. 26            | Autres crimes. 26        | Autres crimes. 26            | Autres crimes. 26        | Autres crimes. 26            | Autres crimes. 26        | Autres crimes. 26            |
|                                 | Totaux. 1,000                | Totaux. 1,000             | Totaux. 1,000                | Totaux. 1,000            | Totaux. 1,000                | Totaux. 1,000            | Totaux. 1,000                | Totaux. 1,000            | Totaux. 1,000                | Totaux. 1,000            | Totaux. 1,000                | Totaux. 1,000            | Totaux. 1,000                |

Figure 7: Ranking of crimes against persons in seven age groups. Connecting lines show some noteworthy trends. Source: Guerry (1833), Plate IV. Coloring of lines added by author.

This quest to examine motives and causes is most apparent and impressive in his analysis of suicide, a topic of considerable debate in both the medical community (which considered it in relation to madness and other maladies) and the legal community (which considered whether it should be a crime or at least within the purview of the justice ministry).

*“What would be useful to know would be the frequency and importance of each of these causes relative to all the others. Beyond this, it would be necessary to determine whether their influence . . . varies by age, sex, education, wealth, or social position”* (Guerry, 1833, page 131, WR trans.).

To this end, he carried out perhaps the first content analysis in social science by classifying the suicide notes in Paris according to motives or sentiments expressed for taking one’s life. This approach to the study of suicide would later be adopted by Durkheim (1897), but without much credit to Guerry and other moral statisticians.

As well, to discuss geographical differences and relate these moral variables to each other, he prepared six thematic maps of France. To those of Balbi & Guerry on personal crime, property crime and education, he added: illegitimate births, donations to the poor and suicide, but based on more complete data and better indicators. Figure 8 shows Guerry’s maps, reproduced from his data using modern software.

For ease of comparison, these variables were all expressed in a form such that “more is better,” for example, population per crime or percent able to read and write. In preparing the maps, these variables were first converted to ranks and then the départements were shaded according to rank, so that darker tints were applied to the départements that fared worse on a given measure (more crime, less education). We can see that the geographic patterns of the two types of crimes and literacy is similar to those displayed in Balbi and Guerry with worse personal crime and literacy in the South of France.

Suicides are more pronounced in the North as are illegitimate births, but to a lesser degree. Guerry discussed each of these in turn.

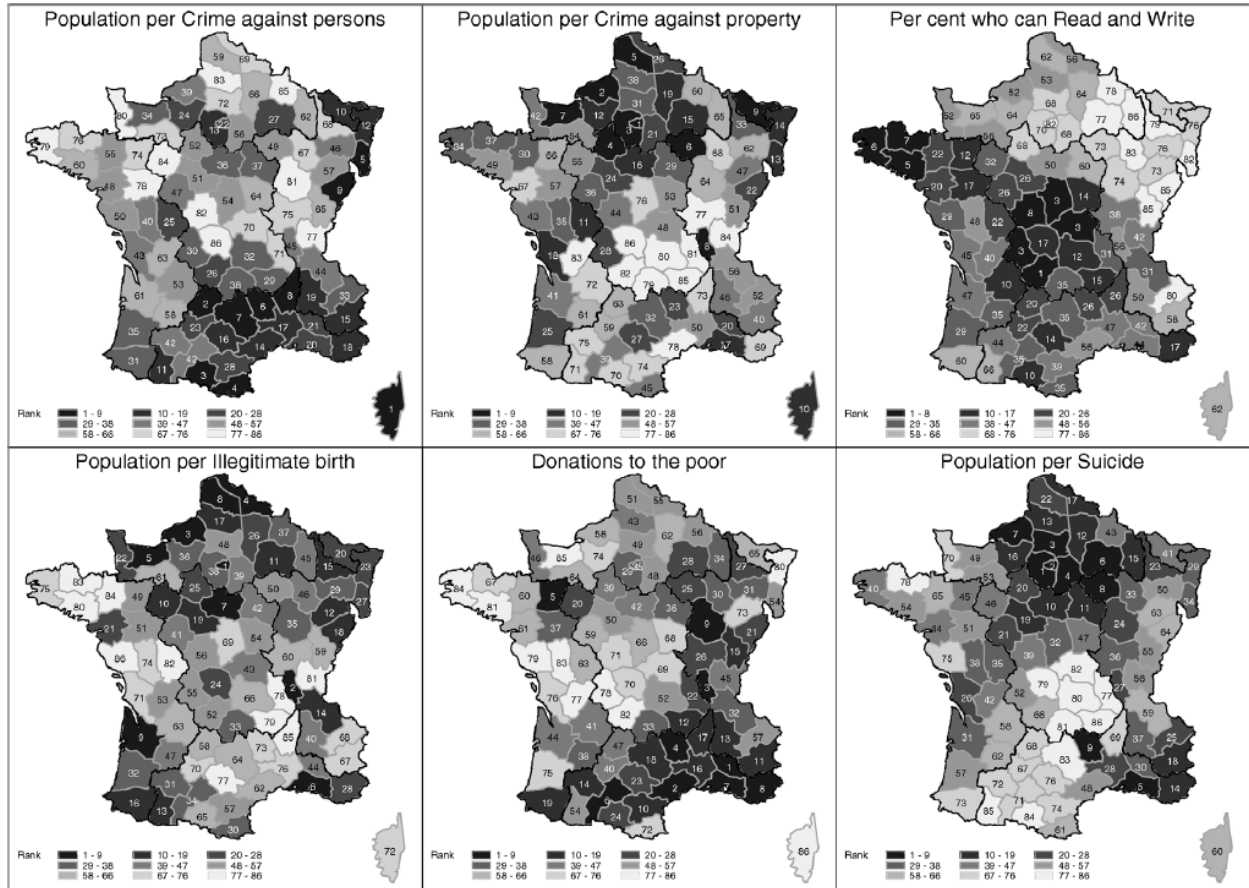


Figure 8: Reproduction of Guerry's six maps. Color coding, as in Guerry's originals, is such that darker shading signifies worse on each moral variable. Numbers for each département give the rank order on that variable. Source: Author.

### Guerry(1864): *Statistique Morale de l'Angleterre Comparée ...*

Guerry's most ambitious work, and the capstone of his career, did not appear for another 30 years, but it was well worth waiting for. *The Statistique Morale de l'Angleterre Comparée avec la Statistique Morale de la France* was published in a grand format (56×39 cm); it contains an introduction of 60 pages and 17 exquisite color plates.

A personal note: Very few copies of this work were known to exist in 2005 when I began my research on Guerry. I initially located copies in the Bibliothèque National de France (BNF) in Paris and the British Library (BL) in London. A visit to the BNF was disappointing, because the color plates had been separated from the text and resided in the Département des Cartes et Plans. On the same trip I visited the BL and rejoiced when I could see the entire volume. I vividly recall the moment this book was delivered to my table in the reading room. I was awestruck by the quality and detail of the comparative thematic crime maps of England and France. But alas, I was unable to obtain scans or images of the color plates. In the next year, I discovered a copy in the Staatsbibliothek Berlin and in a visit there was able to

arrange for high-resolution scans of the plates, which I use here. Since that time, I am happy that the entire work, text and plates have been digitized and are available from several sources.<sup>11</sup>

The introduction to this work sets out Guerry's view of the history of the application of statistics to the moral sciences. The title here sets out an ambitious scope: History of the Application of Numbers to Moral Sciences.

In it, he proposes to replace the term "moral statistics" or simply documentary statistics with "analytical statistics." The former, presented almost invariably in tables, is concerned with the numerical exposition of facts. The latter presents the successive transformation of these facts, by calculation, by concentration and their reduction to a small number of general abstract results. One can see here a thorough explanation of the graphic method applied to moral and social data.

One cannot fail to be impressed by the sheer volume of data summarized in Guerry's tables and graphic maps for different aspects of crime and other moral variables in France and England. These include over 226,000 cases of personal crime in two countries over twenty-five years and over 85,000 suicide records, classified by motive. Guerry estimated that if all his numbers were written down in a line, they would stretch over 1,170 meters! Hacking (1990, p. 80) credits this observation as the source of his phrase "an avalanche of numbers," referring to the huge volume and range of data on social issues that became available in this period. In this work, Guerry anticipates the age of big data.

### Drilling down, seeking explanation

As one example of his method he illustrates how to summarize and represent a distribution of crimes of given types with successive levels of abstraction. This is one of the earliest examples of smoothing a time-series by running sums or means at different scales and then extrapolation to the larger series. Starting in the bottom row in the main table one averages the bracketed entries, projects these to the full series and then proceeds to the next level.

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<sup>11</sup> One digital copy is available from the University of Marburg, <https://bit.ly/38W6dud>

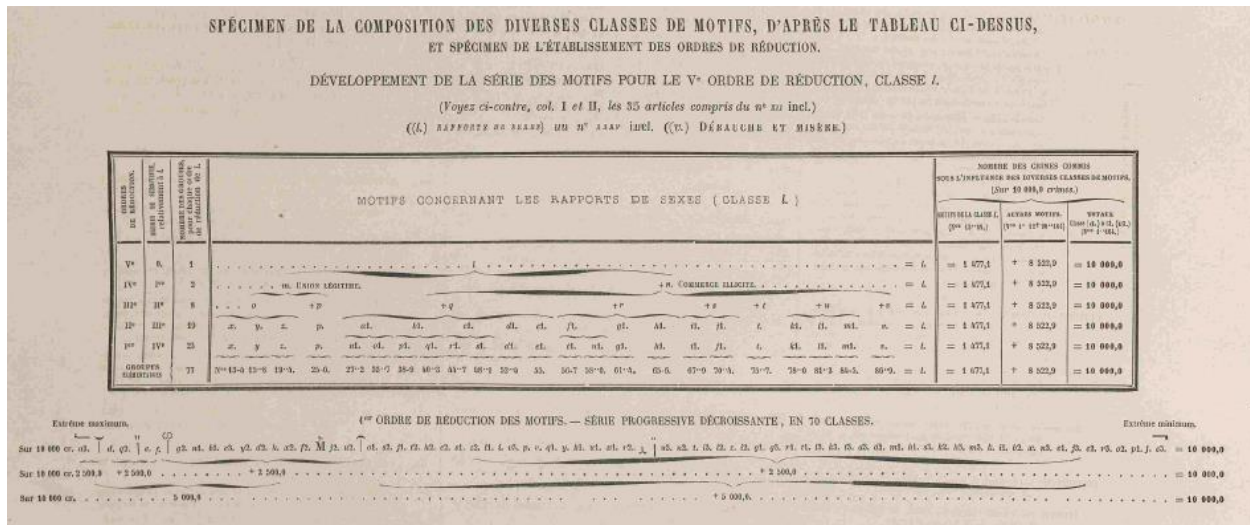


Figure 9: Specimen of the composition of the various classes of motives ... and specimens ... of the orders of reduction. Source : Guerry(1864), p. LXII.

He doesn't apply this method in the 1864 volume, but there are several fine examples included in his earlier Guerry (1832b) paper dealing with apparent motives for capital crimes, drawn from the records for the five years 1826—1830. It is not entirely clear how Guerry derived these motives from the records in the *Compte générale*, but it is reasonable to suppose they were detailed in the reports submitted by the departmental judicial offices. His goal here is to attempt to discern general classes of reasons for which the most serious crimes of violence are committed. As far as I am aware, this is the earliest study of the personal social factors leading an individual to take another's life.

He begins with a summary table of apparent motives for groups of all capital crimes in order of relative frequency in 1000 crimes: I. hate, vengeance, resentment (264); II. Domestic dissention, hatred between parents (142); ... VII. Adultery (64); ... IX. Desire to collect an estate or annuity (26); down to XII. Jealousy (16). A second table classifies the motives according to the nature of the crime: poisoning, murder, assassination, and arson. For example, adultery is the most frequent motive for poisoning (346 per 1000), while hate, vengeance, resentment ranks first for all the other types. A third table turns this joint tabulation on end: for each category of motive, it lists the ranked frequencies of the types of crime committed.

Figure 10 illustrates one of several final results of this process of successive sub-classification of capital crime, in this case motivated by debauchery, seduction and concubinage (living together as man and wife). Here, the attacks on life are categorized by the nature of the perpetrators at three levels: directly involved in an illicit relation vs. third parties, then by men vs. women or parents vs. strangers and finally by as many sub-groups as could be discerned. In modern language, Guerry is providing a method for a Drill Down table to let the reader step through a hierarchy of grouped and summarized data to view varying levels of detail.



**CRIMES D'EMPOISONNEMENT, DE MEURTRE ET D'ASSASSINAT,  
PAR SUITE DE DÉBAUCHE, DE SÉDUCTION ET DE CONCUBINAGE.**  
(Tableau de développement.)

|  |   | S. 1,000   | S. 1,000 | S. 1,000 |   |
|--|---|--|----------|----------|---|
| <b>ATTENTATS A LA VIE.</b>   | <i>Des hommes.</i>  | D'hommes qui avaient séduit les parentes des accusés (filles, sœurs ou nièces).      | 123      | } 218    | <b>DE PERSONNES OUTRAGÉES OU ENGAGÉES DANS DES RELATIONS ILLICITES.</b> |
|  |   | D'hommes, à la suite ou à l'occasion de scènes de débauche.                          | 29       |          |   |
|  |   | D'hommes, par leurs concubines qu'ils avaient abandonnées.                           | 22       |          |   |
|  |   | De rivaux, en commerce illégitime.   | 22       |          |   |
|  |   | De séducteurs, pour s'en débarrasser.  | 15       |          |   |
|  | De garçons, après attentat à la pudeur.   | 7  |          |          |   |
|  | <i>Des femmes.</i>  | De jeunes filles après attentat à la pudeur, pour prévenir la plainte.               | 167      | } 899    |   |
|  |   | De concubines qui avaient abandonné les accusés.                                     | 145      |          |   |
|  |   | De femmes séduites, pour s'en débarrasser.   | 138      |          |   |
|  |   | De prostituées, dans des maisons de débauche.  | 102      |          |   |
|  |   | De j. filles, à la suite de tentatives d'avortem. par un médecin ou leurs séducteur. | 36       |          |   |
|  |   | De concubines et de filles séduites par leurs complices.                             | 36       |          |   |
|  |   | De j. filles, par leurs séducteurs au mariage desquels elles étaient un obstacle.    | 22       |          |   |
|  |   | De fem. engagées dans un comm. illicite, par suite de discussion ou de jalousie.     | 14       |          |   |
|  | De concubines, par des breuvages destinés à les rendre stériles.                    | 7  | } 681    |          |   |
| De prostituées.  | 7   |  |          |          |   |
| De concubines, par leurs amants, de peur qu'elles ne leur fussent infidèles. | 7   |  |          |          |   |
| <i>Des parents.</i>  | De pères de filles séduites par leurs séducteurs.                                   | 22   |          | } 44     |   |
|  | D'enfans issus d'un commerce illicite.  | 15   |          |          |   |
|  | De frères qui voulaient faire cesser les relat. de leurs sœurs avec les accusés     | 7  |          |          |   |
| <i>Des étrangers.</i>  | D'hommes qui avaient averti les pères des relat. de leurs filles av. c les accusés. | 15   |          | } 101    |   |
|  | D'hommes qui avaient enlevé des filles à leurs ravisseurs.                          | 14   |          |          |   |
|  | D'hommes dont les concubines des accusées avaient à se plaindre.                    | 14   |          |          |   |
|  | De parens de femmes à la pudeur desquelles les accusés avaient attenté.             | 7  |          |          |   |
|  | De personnes qui avaient donné asile à des filles enlevées.                         | 7  |          |          |   |
| <b>TOTAUX.</b>   |   | 1,000  | 1,000    | 1,000    |   |

Figure 10: Crimes of poisoning, murder and assassination as a result of debauchery, seduction and concubinage (table of development). Source: Guerry(1832b), p. 343.

### The Plates

Fifteen of the plates show data for the départements of France (from 1825 to 1855) or the counties of England (1834–1856) on a particular topic, first for France, then for England: crimes against persons, crimes against property, murder, rape, larceny by servants (vol domestique), arson, instruction and suicide (only for France). In each case, to ensure comparability of the numbers for the various crimes across départements and counties, and from one measure to another, Guerry standardized the rates for each map and country to “degree of criminality,” with a mean of 1000 and a common metric. At a local level, one could easily see where Paris/Seine or London stood on murder or arson; at a global level one could see the distribution of crimes over the entire countries.

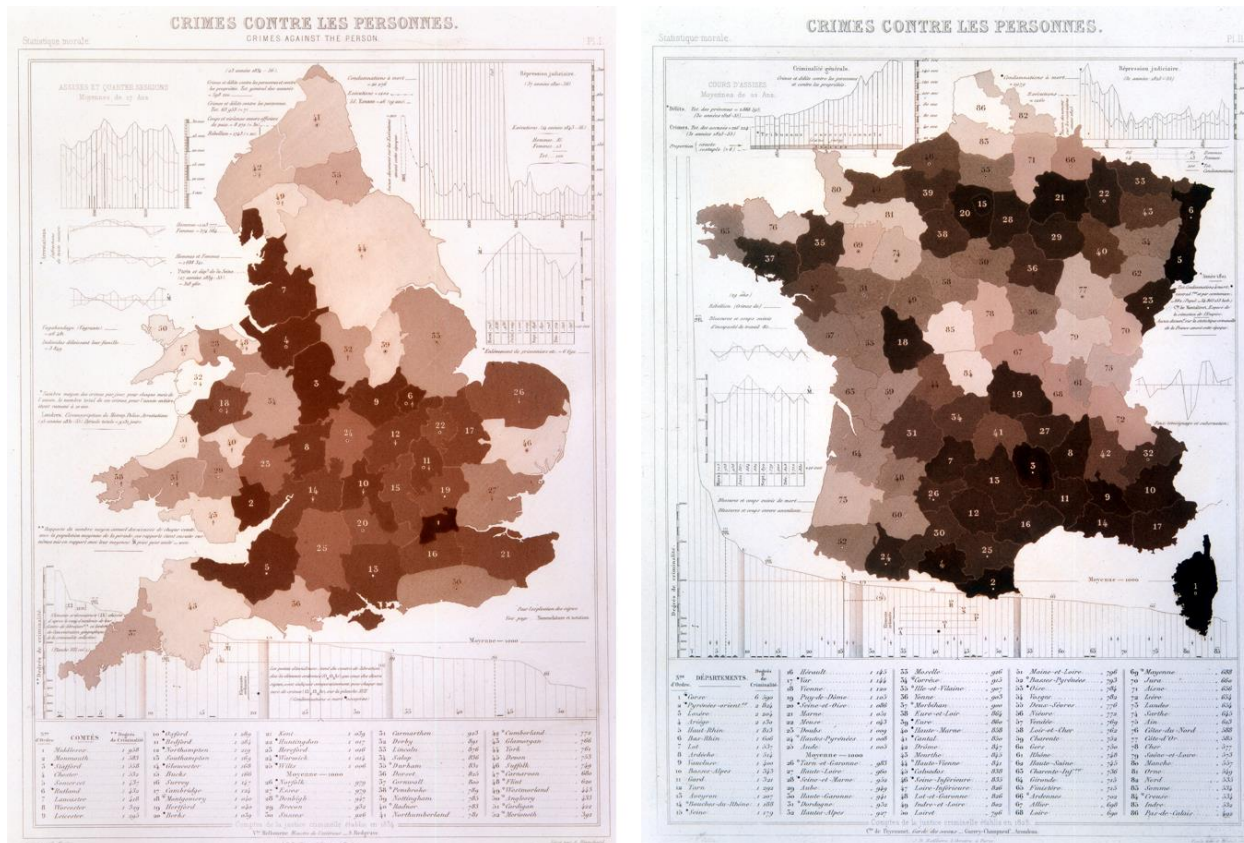


Figure 11: Guerry (1864), Crimes against persons in England (Plate 1, left) and in France (Plate 2, right). Image source: Courtesy of Staatsbibliothek zu Berlin.

These plates exemplify the program of *statistique analytique* that Guerry had in mind, as illustrated in Figure 11. The map of England or France shows the geographic distribution, with counties or départements shaded according to their rank order on the variable, the highest (rank = 1) shaded darkest and the lowest shaded lightest.<sup>12</sup> A large variety of special symbols and annotations are used on the maps to indicate noteworthy patterns or circumstances, for example, up or down arrows to show increase or decrease over time in a geographic unit. The table below each map lists the ranks and data values, expressed as “degree of criminality.”

Each map is an overall summary for 30 years, for all accused and for all crimes in each class. Guerry wanted also to show patterns, trends or deviations within these data. Thus, surrounding each map, he placed a variety of line graphs designed to decompose or transform these overall facts or to relate them to other factors.

Most of these featured time series graphs of trends over time, often decomposed into separate series by subtype of crime or characteristics of the accused, such as age or sex, or other aspects that should be

<sup>12</sup> The overall level of darkness in these two maps should not be taken as evidence that personal crime was much greater in France than in England. The difference is more accounted for by the quality of the scans of these images.



considered. For example, the top portion of Plate 2 (Figure 11, right), is shown here in Figure 12. At the left it shows a time series graph of the number of people accused of crimes and misdemeanors against persons and property (labeled “general criminality”). The graph at the right is meant to show the overall trend in judicial decisions on crimes over this 30-year period: the numbers condemned to death and the numbers executed. Guerry’s intent is to place these in a wider, explanatory context.

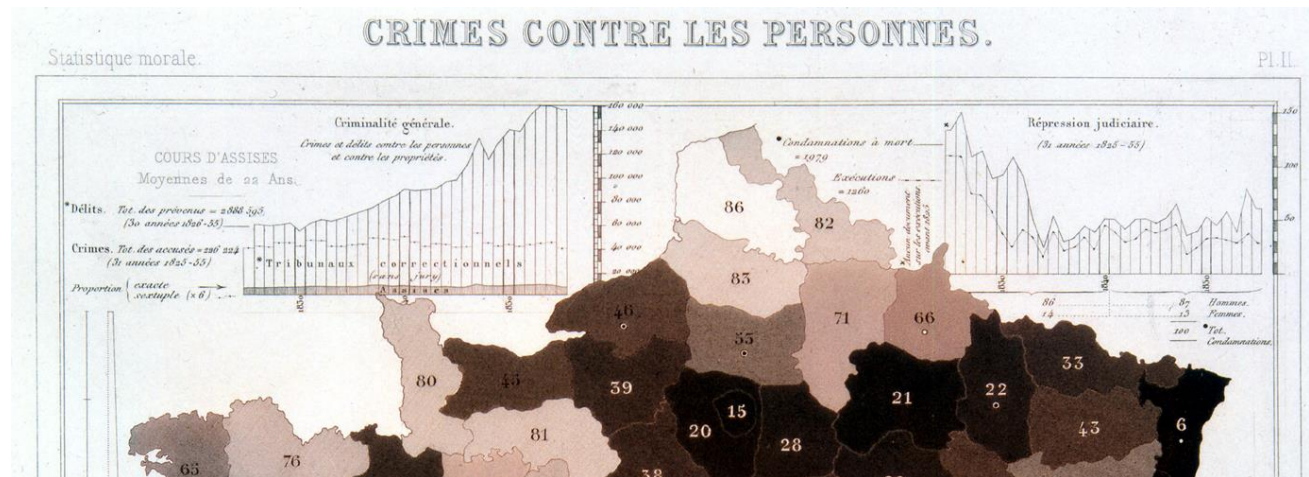


Figure 12: Detail from Guerry (1864) Plate 1, showing time series charts of number of people accused of crimes and misdemeanors against persons and property (left) and the numbers condemned to death and executed 1825–1855.

Other inset graphs in these plates show the distributions of crimes by month of the year; these reveal that crimes against persons were greatest in the summer and least in the winter; property crimes in France showed the reverse pattern. Beneath the map, an index plot of the degree of criminality values by rank shows the form of the distribution across counties and départements. Again, many special symbols are used to mark the minimum, maximum, mean, median, increase or decrease, possibly fallible numbers and so forth; the nearly 100 such symbols defined in an appendix clearly required some typographic calisthenics, as they run through several alphabets plus the available diacritical marks.

There were many were apparently novel findings here and Guerry provided explanations for only a few. One that struck a reviewer of his 1851 BAAS exhibition was the “remarkable difference in bigamy between England and France, that crime appearing to be much more prevalent in England. He accounted for this circumstance by the difference in the forms of marriage required by law, which afforded much greater facilities for tracing personal identity in France than in England.” (BAAS, 1851, p. 101). Reading between the lines, Guerry is pointing here to the general difficulty of national comparisons, where different standards may have been applied in recording or coding the data. Another concerned the time trends shown in the inset graphs, leading to the inference that “the progress in the amount of instruction in each department of France, instead of being in the districts where most wanted, had on the contrary been, with singular regularity, in the districts where the greatest instruction had previously prevailed.”

The final two plates serve as the culmination of Guerry's program of analytical statistics and provide an ambitious attempt to delineate multifactor and multivariate relations among rates of crime in England and France; these are discussed in the subsection below.

### Synthesis: Guerry's Magnum Opus

By 1864, Guerry was striving for more general, analytic methods to reveal the regularity and variation in moral statistics. He had an enormous amount of data: 30 years for France, 23 for England. In the final two plates he abandoned the geographical framework of the map to highlight more general patterns in crime and relations with explanatory and possibly causal factors, and how these compare in England and France.

Plate 16 (shown in Figure 13) is devoted to a detailed comparative analysis of the age distribution for various crimes and suicide (only for France, bottom left). In contrast to the ranked lists he had used earlier (Figure 7), he used side-by-side displays for England (197,000 accused of known age) and France (205,000 accused) of 10 collections of frequency distributions across age for crimes in various categories (theft, arson, murder, indecency and so forth). Each block provides separate curves comparing the age distributions of subtypes within a given category (e.g., Block I: rebellion, assaults on peace officers; Block II: murder, manslaughter, grave wounding). Various annotations on the charts show the mean (M), missing data (small circles, indicating no crimes recorded in a given age category), the relative frequency of crimes committed by those under 21 and so forth.

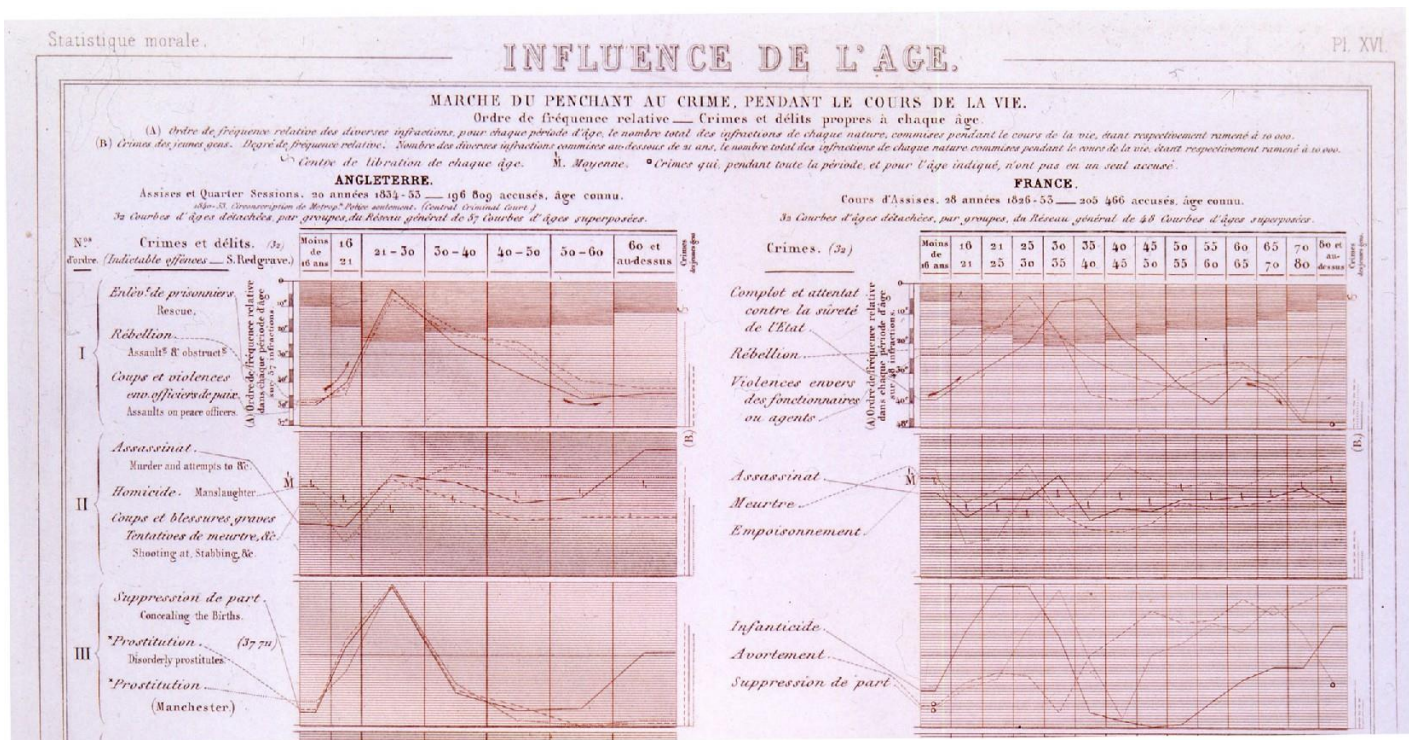


Figure 13: Top portion of Plate 16 from Guerry (1864) comparing the age distributions of various crimes in England (left) and France (right).

The last plate (Plate 17, shown in Figure 14), titled *Causes Générales des Crimes*, is by far the most impressive and also the most complex. I call this “Guerry’s Magnum Opus”, a tribute both to his program to seek a more general understanding of the nature of crimes and potential causes or at least explanations, and also to its’ inventiveness and excellence in execution.



CAUSES GÉNÉRALES DES CRIMES.

Statistique morale.

Pl. XVII.

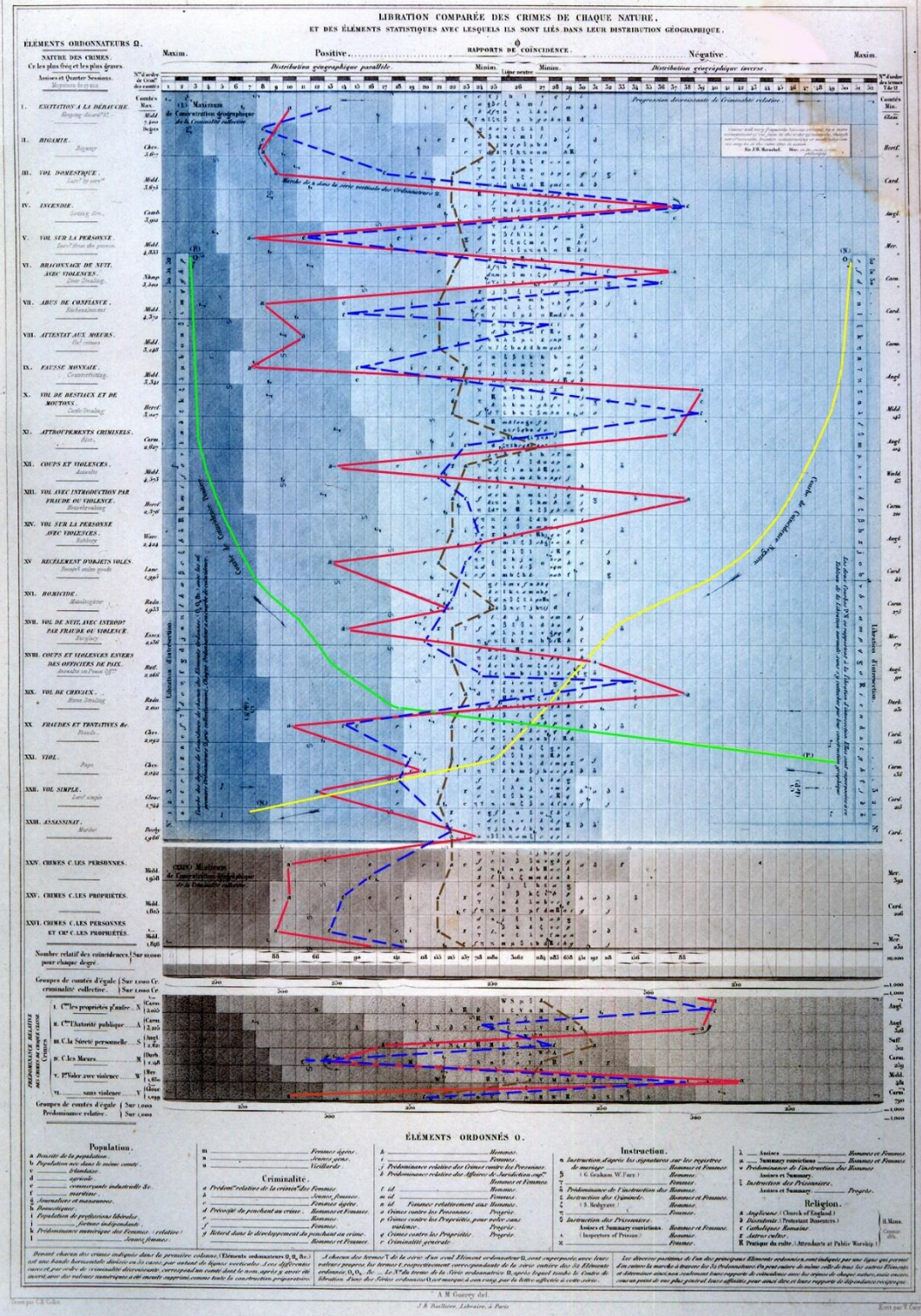


Figure 14: Guerry (1864) Plate 17: General causes of crime. Lines in this chart show the association of potential causes with prevalence of a given type of crime, from maximum positive at the left through minima in the middle to maximum negative at the right. Color and line type of the highlighted curves were added by the author.

It is a novel semigraphic table devised to show the multivariate associations of various types of crimes with other moral and population characteristics, but at a time when even bivariate methods were unknown. The image shown here cannot do justice to the original, so I will try to describe it and also convey the sense of awe I felt when I first saw it in the British Library. Guerry's goal here is to show the factors associated both positively and negatively with crimes and their geographic distribution, using data from England as a specimen of this approach.

The chart is headed "Libration Comparée des Crimes de Chaque Nature et des Éléments Statistiques avec Lesquels ils sont Liés dans leur Distribution Géographique" (Comparative libration<sup>13</sup> of the crimes of each nature and the statistical elements with which they are linked in their geographical distribution). The rows show 23 types of crimes ordered by frequency and seriousness from top (debauchery, bigamy, domestic theft) to the bottom (fraud, rape, murder). Just below this are sets of summaries condensing these into crimes against persons and property, and other general categories. The columns refer to the rank orders of the 52 counties of England on each crime separately. Thus, on crimes against persons, Middlesex stands at rank 1 (left), with a "degree of criminality" of 1958, while Merioneth is at rank 52 (right) with 392. For the crime of arson, different counties occupy these ranks, of course, but it is the characteristics of the counties at various ranks that Guerry wants to show.

The entries in this graphic table are symbols for a variety of moral and social characteristics found either with high prevalence or low prevalence in the particular county at each rank for each crime. The legend at the bottom identifies the following kinds of symbols: (a) those for aspects of population (density of population, percentage of Irish, agricultural, maritime, domestics, etc.); (b) aspects of criminality (predominance of male, female, young, old, etc. relative to the average); (c) instruction (predominance of instruction of males, of criminals, of prisoners); (d) aspects of religion (Anglicans, dissidents, Catholic, etc.; attendance at public worship).

Overlaid on this are several sets of lines tracing profiles of the "centre de libration" of various types of social indicator symbols, apparently calculated as quartiles (or other quantiles) of the associated mass functions. One curve, colored red, for the symbol a (population density) is drawn as an example and labeled "path of a in the vertical series of ordinates," the idea being that one could see directly to which crimes population density was related positively (bigamy and domestic violence) and negatively (arson and cattle theft). This swings widely from left to right, indicating that population density is strongly associated with these crimes. The dashed blue curve reflects the percent of Irish in the counties. This largely tracks with the curve for population density in the top half of the figure. The dashed brown curve remains largely in the middle, indicating that it reflects a characteristic largely unassociated with these crimes.

Starting at the left (right) are two other smoothed curves labeled "curve of positive (negative) coincidence," colored green and yellow respectively. These reflect some (unknown) sort of average. As

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<sup>13</sup> "libration" is an astronomical term, referring to a real or apparent oscillatory motion, especially of the moon. Guerry uses this here in a poetic sense to refer to the ups and downs, waxing and waning of the various crimes he is charting.

they progress from the less serious crimes at the top to the more serious ones at the bottom, they switch polarity from positive to negative or the reverse.

An inset quotation from J. W. Herschel (1831) in a box at the top right sums up Guerry's anticipation of the utility of his method, and a caveat: "Causes will very frequently become obvious by a mere arrangement of our facts in the order of intensity, though not of necessity, because counteracting or modifying causes may be at the same time in action."

It should be noted that Guerry intended this only as a specimen. He did not provide an analysis of these data or the obvious parallel chart for France, nor did he draw conclusions about the many relations between crimes and these social and moral aspects. He states in the introduction that such discussion will be the subject of a subsequent book, but this was never published.

This magnificent volume, published in 1864, had been crowned by the Académie in 1860 and was awarded the Prix Montyon the following year (Bienaymé, 1861). As mentioned earlier, In October of 1864, Guerry, who had been made an honorary member of the Statistical Society of London (SSL), travelled to England to attend the BAAS. *The Statistique Morale de l'Angleterre* and its splendid 17 plates were put on public display for the nearly 2800 members who attended and became the subject of a commentary by W. Heywood, vice-president of the SSL.

## Guerry vs. Quetelet

In this essay I largely credit Guerry for his fundamental work on moral statistics and the important new idea that the constancy of measures of crime, suicide and so forth over **time**, combined with the systematic variation in these measures over place, season, location and so forth over **circumstances** should be seen as evidence for social laws, akin laws that help us understand the physical domain. A neutral view sees both Guerry and Quetelet as the cofounders of modern, empirical social science (Lotin, 1912; Porter, 1986; Radzinowicz, 1965, 1966; Whitt, 2002). Yet this honor is most often accorded to Quetelet (1831) for his *Recherches sur le penchant au crime aux différents âges*. Quetelet went to great lengths to establish his priority for these ideas, and so it is of some interest to summarize the history of this dispute, as well as parallels and differences between their approaches.

The important event that stimulated both Guerry and Quetelet to take up the study of crime statistics was the creation in 1825 of the *Compte générale de l'administration de la justice criminelle en France* by the Ministry of Justice. By 1827, the time of the first report of the *Compte*, Guerry was working to compile the data collected by the Ministry; he was appointed Director of Criminal Statistics in 1830.

We know that Guerry began his work on the topic that would consume his life in 1829, with two projects: the Balbi and Guerry graphic study of relations between crime and education (Figure 1), and his analysis of cyclical phenomena of weather and records of hospital admissions, births, suicides, etc. His 1833 *Statistique Morale de La France* is often held to be his first work on the tabulation of crimes over multiple years and breakdowns by factors exhibiting constancy over time.

However, as noted by Whitt (2002, p. xxiii), in 1832 Guerry published two short works on criminal statistics. One (Guerry, 1832b) takes up the topic of the motives of capital crimes; the subject of motives



was one he repeatedly returned to, particularly for suicide. The other (Guerry, 1832a) first appeared in the *Revue Encyclopédic* of August 1832. It is the written text on the relationship between crimes and education that might have accompanied his 1829 maps with Balbi. Using data for the years 1825—1829, he presents on crimes against persons and property by region of France. It is here that he first states the idea of the constancy of crime:

*The geographical distribution of crimes against persons and against property, whatever the cause, is today perfectly known. It reproduces each year in a uniform way. ... We will observe that if the order in which the departments are arranged in the table preceding is not strictly exact, it is not less certain that, as soon as the departments are joined together in groups, the partial errors are compensated, that this order becomes almost invariable, and that it is even then determined by numerical proportions not very different between them.* (Guerry, 1832a, p. 8).

Quetelet's path to what he called "social physics" began following his return to Belgium in 1824 from the Paris Observatory. There he had been introduced to the mathematicians Fourier, Poisson and Laplace and led to appreciate theories of probability and the application of statistical methods to celestial phenomena through the recognition of distributions of empirical observations and numerical summaries representing central tendency and variation.

From this, he was most impressed with the statistical ideas embodied in Laplace's celestial mechanics and his suggestion, "Let us apply to the political and moral sciences the method founded upon observation and upon calculus, the method which has served so us well in the natural sciences." (Laplace 1825; 1917:107). In the years from 1825—1830 he set out to do just that. A sample of the titles of brief papers, most in the *Mémoires de l'Académie de Bruxelles*, shows the trajectory of his thinking:

- Memorandum on the Laws of Births and Mortality in Brussels (1826)
- Research on Population, Births, Deaths, Prisons, Workhouses, etc. (1827)
- On the Constancy Which is Observed in the Number of Crimes Which are Committed (1830a)
- On the Number of Crimes and Offenses in the Provinces of Southern Brabant, Flanders, ... (1830b)
- Research on the Law of Growth of Man (Quetelet, 1831b)

In these, Quetelet started with simple, direct measures of human populations: births, deaths, marriage and of individuals: height, weight, strength, etc. After some initial studies of crimes, *Research on the Propensity for Crime at Different Ages* in 1831 laid out his first ideas of social mechanics. The most prominent of these was social analog of the mean of a set of intrinsically variable natural observations, but becoming increasingly accurate, via the law of large numbers, as the number of data points increased. This social analog, the "average man" (*l'homme moyen*) as the center of gravity became a simple, yet powerful, metaphor for the regularity in the distribution of human physical characteristics, which he then applied to social and moral qualities such as drunkenness, suicide and crime.

His theoretical program is illustrated by Figure 15, a chart of the propensity to crime over age of the accused. This was derived from tables from the *Comptes général de la justice* for 1826--1829 listing the

number of accused by age groups for property and personal crimes, estimates of the populations in each age group and then dividing the number of crimes by the population in the respective age groups. Remarkably, he proposes an empirical formula,<sup>14</sup>

$$Y = 1 - \sin(X) \frac{1}{1+m} \quad \text{supposing} \quad m = \frac{1}{2^x - 18},$$

for the propensity Y in relation to age X. He made much of the fact that propensity to crime reached a maximum at 25—30 years of age and then declined, but he overstepped logic by appealing to a concrete yet specious explanation:

*Among all the causes which have an influence for developing or halting the propensity for crime, the most vigorous is, without contradiction, age. It is, in fact, with age that man's physical strength and passions develop and that their energy afterwards diminishes. It is also with age that reason develops which still continues to grow when strength and passions have already exceeded their maximum intensity. ... The propensity for crime, on the contrary, must be at its maximum at the age where the strength and passions have attained their maximum, and where reason has not acquired sufficient command to dominate their combined influence. [Quetelet [1831] 1984, p. 54--55].*

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<sup>14</sup> In this formula, X should be in radians, so the term is  $\sin(\text{age} * \pi/180)$ . See <https://rpubs.com/friendly/propensity> for an exploration of Quetelet's data and the fitted curve.



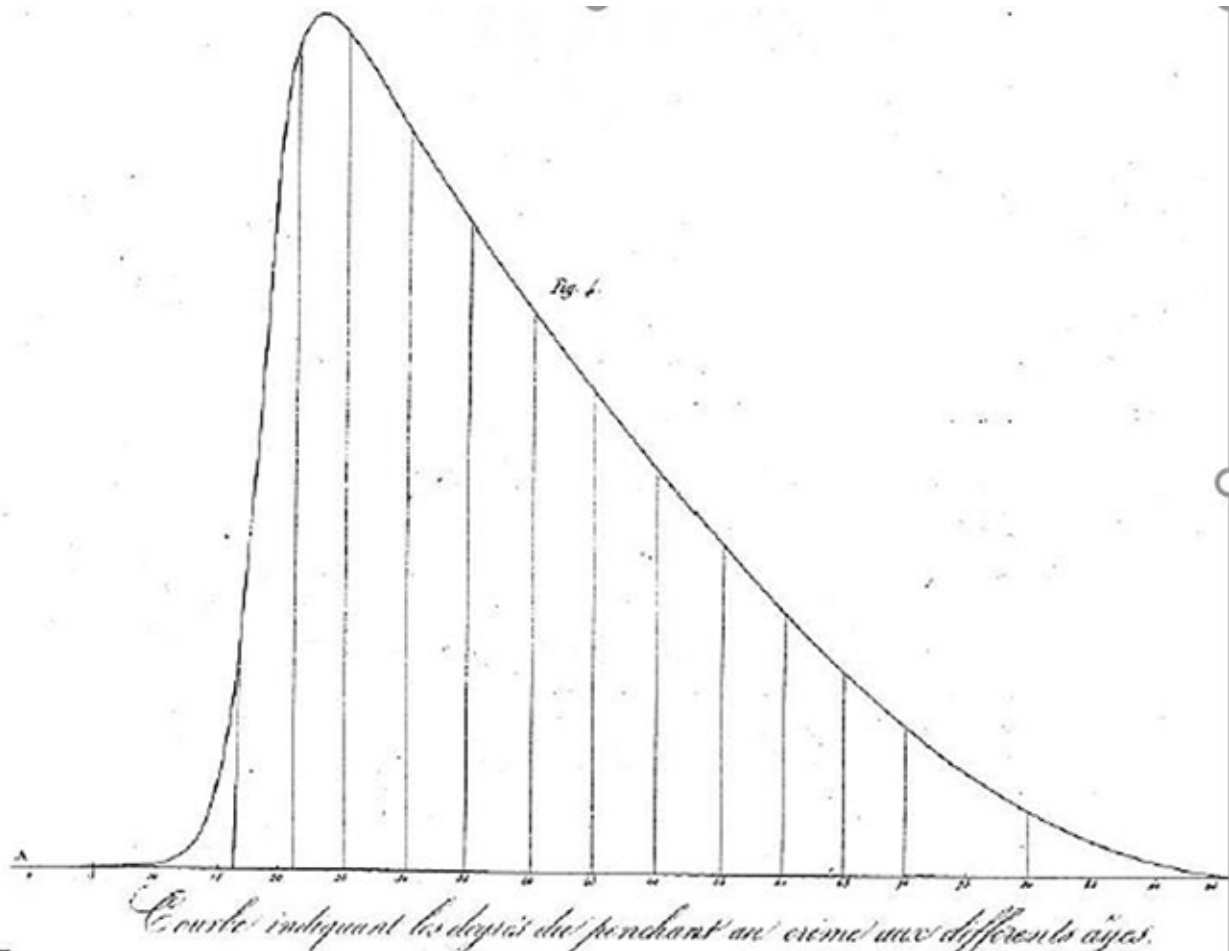


Figure 15: Carte indiquant les degrés du penchant au crime aux différents âges. (Chart showing degrees of propensity to crime at different ages). Source: Quetelet (1831, Fig. 4; PI III)

He expanded and extended these themes over many years ... but it is in the 1831 Propensity for Crime monograph that the priority dispute arises. At the end of this monograph, he includes a letter from Guerry dated September 11, 1831. He introduces this by saying,

*One will appreciate, without doubt, the motives which have inclined me to present here the extract which M. Guerry was willing to communicate to me concerning the new work which occupies him and which will be able to be published only after mine.* [Quetelet [1831] 1984, p. 70].

Again, in the third book of *A Treatise on Man*, Quetelet writes about *his* discovery of the constancy of crime:

*As this idea has continually presented itself to me in all my researches on man, and, as I have exactly expressed it in the same terms as those of the text, in my conclusions on the Recherches sur le penchant au crime, a work that appeared a year before that of A. M. Guerry, I have thought it necessary to mention the point here, to prevent misunderstanding* (Quetelet, 1842, p. 96).

Quetelet's motive here was clearly not simply to prevent misunderstanding, but to establish his priority on the issue of the constancy of crime. In printing most of Guerry's letter, he also sought to denigrate

Guerry's contribution as subordinate to his own. The implication is that "I said this first and said it better." The consensus of scholars (Beirne, 1987; Lotin, 1912; Whitt, 2002) is that Quetelet does indeed have the edge in terms of timing of publication. I largely agree with Leon Radzinowicz's overall conclusion (but I would place the difference in time at no more than one year):

*I cannot escape the conclusion that in terms of chronology, there was very little between the two, not more than two years at the utmost. In their fundamental substance the two contributions were virtually parallel, and I feel it is fair to say that the sociology of crime owes its inception to Guerry as surely as it does to Quetelet. (Radzinowicz, 1966, p. 33)*

## Parallels and Contrasts

In reviewing these works, I am struck by the remarkable similarity in concept, but differences in both language and technique, between Quetelet and Guerry on the essential recognition of the constancy of rates of crime over a span of years, and the use of this to argue for law-like behavior in realm of social statistics.

Quetelet (1831) included 18 tables giving counts of crimes over years, breakdowns by sex of the accused and the ratios of men/women or of crimes against persons/property. Using the data for 1826—1829, his recognition of constancies was based on similar numbers in the frequencies or ratios over time. He describes these results in vivid terms which stir the imagination:

*So, as I have had occasion to repeat several times before, one passes from one year to another with the sad perspective of seeing the same crimes reproduced in the same order and bringing with them the same penalties in the same proportions. Sad condition of the human species! The share of prisons, chains, and the scaffold appears fixed with as much probability as the revenue of the state. We are able to enumerate in advance how many individuals will stain their hands in the blood of their fellow creatures, how many will be forgers, how many poisoners, pretty nearly as one can enumerate in advance the births and deaths which must take place. (Quetelet 1831, p. 69)*

Guerry's demonstration of these constancies is more direct and convincing. As illustrated in Fig. 5 & 6, he shows the percents of crimes over years, broken down by sex, age and drilling down to different types of crimes committed in varying seasons. This consistency, within 1 or 2 percent, over the years 1826—1830 demonstrated the stability of these trends. Combining this with systematic differences between regions, males and females, type of crime and season allowed him to see lawful behavior in the data from the *Comptes général*. In summarizing these patterns, Guerry comes to nearly the same conclusion as Quetelet, but states it less dramatically:

*Criminal statistics becomes as empirical and accurate as the ether observational sciences when one restricts oneself to the best-observed facts and groups them in such a way as to minimize accidental variation. General patterns then appear with such great regularity that it is impossible to attribute them to random chance. Each year sees the same number of crimes in the same order reproduced in the same regions. Each type of crime has its particular invariant distribution by sex, by age, and by season of the year. (Guerry [1833] 1833, p10) ... We are forced to conclude that the facts of the moral order are subject, like those of the physical order to invariable laws. (p14)*

These differences in style are noteworthy in assessing their influence and contributions to the founding of a scientific criminology and ultimately social science. Again, I quote Radzinowicz:

*Quetelet's exposition was, on the whole, wider, more of a synthesis, bolder and more compelling. Guerry's was more cautious, and perhaps more thorough, illumined by his penetrating insight into the fundamental problems of social research. Their qualities were, indeed, complementary.* (Radzinowicz, 1966, p. 33)

Finally, we should note the differences in style, technique and effectiveness for visual communication in the thematic maps Guerry and Quetelet used to advance their arguments. Kindynis (2014, p. 223) credits both with the “first recognizable examples of crime maps” in the early 19<sup>th</sup> century and the insights to be gained from comparative maps of crime and other social features such as education, suicide and poverty. Quetelet (1835; 1842) included several maps of crimes against persons and property and of instruction in France and the Low Countries. However, he used an isarithmic map technique representing the distributions by continuous shading without boundaries of departments, making it difficult to discern general or local patterns across geographic regions. In contrast, Guerry (1833) used the choropleth technique, shading departments with a graded scale, which made visual assessment of geographic correlation direct and transparent. The marvelous plates in his 1864 volume (Figure 11 and Figure 12), with their detailed charts of trends over time, enhanced the theory and practice of cartographic representation of social variables in ways that stand out as important milestones in the history of data visualization. I conclude that Guerry did indeed put criminology on the map.

## Conclusions

In my account of the history of data visualization (Friendly & Wainer, 2021), there are many individuals who stand out for their contributions to the emerging combination of empirical data and visual thinking, to try to answer important scientific and social questions of their day. In different ways they all advanced the idea that data, shown in a graphical display could “speak to the eyes” (and brain) in ways that numbers, tables of numbers and even words could not begin to approach.

Among these, some of my heroes of this history, such as John Snow, Florence Nightingale, Francis Galton and Adolphe Quetelet, are well-known. They were celebrated in their lifetimes for contributions to scientific discovery and visual explanation. Their portraits exist, there are detailed biographies of their life and works, and there is public recognition of the places they lived and were buried (Friendly & les Chevaliers, 2020).

Other heroes, such as André-Michel Guerry, were recognized and attracted attention only within a limited circle in his time, and in the previous histories of “moral statistics” and criminological sociology, he was often overlooked, overshadowed by the work and reputation of Adolph Quetelet. This article, like my previous work on Guerry, attempts to give fuller details on Guerry's life and work and foster a wider appreciation of his contributions to these topics.

## Supplementary materials

An associated web site, <https://www.datavis.ca/papers/guerryvie>, provides ready access to source materials on Guerry's work and early papers by Quetelet, with some English translations.

## Acknowledgements

I am grateful to Kevin Breault for suggesting a revision of my earlier paper on Guerry and for his generous comments and encouragement throughout this process. For the details of Guerry's life, I am immensely indebted to Jacques Borowczyk, without whose active collaboration and extensive historical research this article could not have been conceived, no less written. I am also grateful to Gilles Palsky, who initiated my interest in Guerry and to Antoine de Falguerolles who has been a constant companion in this historical research. Further, Christopher Green and Howard Wainer and an anonymous reviewer provided helpful comments on the initial draft.

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