

## A History of Statistics in the Social Sciences

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**A**dolphe Quetelet (1796-1874) was a Belgian social statistician and a forerunner in demonstrating the importance of statistics to social science. Amongst his influences were Malthus, Fourier and Laplace (Lazarsfeld 1961, p. 280). Quetelet was convinced that knowledge of causes influenced the course of human affairs more profoundly than his contemporaries appreciated. Prior to the 1820s this type of knowledge was generally regarded in European intellectual circles as evidence of God's hand in ordering the universe. Quetelet argued that the perfection of science could be judged by the ease in which it could be approached by calculation. Statistics emphasize the regularity of social processes, eliminating accidental and random elements in social events to enable a discovery of underlying laws governing phenomena. In this way Quetelet was a pioneer in developing a whole new methodology to be used in the social sciences. He felt that using statistics to gather social knowledge was the solution for the betterment of society.

In 1820, Quetelet was elected to the Royal Academy of Sciences in Brussels. During this time he was engaged in a variety of projects where he applied algebra and geometry to demographic tables. In one instance, he utilized Belgian birth and mortality tables as the basis for the construction of insurance rates. He learned of the potential for such application of calculation to social matter from Malthus's *Essay on Population* (Mc Donald 1993, p.236), Fourier's statistical research on Paris and its environs in the early 1820s (Beirne 1987, p.1150), and, most of all, from the work of his friend and mentor, Laplace, on celestial mechanics (*mechanique celeste*), on the principles of probabilistic theory, and on the method of least squares (Mc Donald 1993, p.188). Originating from the gaming tables of the seventeenth century, the subject of probability had moved rapidly ahead by the early nineteenth century and the stage was nicely set for Quetelet to begin to apply statistical methods on a wide scale.

By Quetelet's fourth publication: *Sur l'homme sur le developpement de ses facultes, ou Essai de physique sociale*, the idea of a social science, which he termed 'social physics,' was firmly in his mind. *A Treatise On Man* (1842) is a translation. Here, Quetelet calculated the average weight and height of subjects and

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cross-tabulated these with sex, age, occupation, and geographical region. In combination these average values produced a statistically arrived at fabrication which Quetelet termed 'the average man.' 'Everything occurs then as though there existed a type of man, from which all other men differed more or less . . . Each people presents its mean, and the different variations from this mean in numbers that may be calculated *a priori*' (Quetelet 1846, *Letters* p. 96). The average man is a concept that is critical to understanding Quetelet's writings because it remains central to all of his statistical studies of society. He believed that 'If the *average* man were ascertained for one nation, he could represent the type of that nation. If he could be ascertained according to the mass of men, he would represent the type of human species altogether' (1831, *Crime* p. 3).

Quetelet details an important and extensive role for his average man. He felt that many scientists would find this property useful, 'The artist, the man of literature, and the savant, will afterwards choose from among these materials best suited to the subject of their studies' (1842, *Treatise* p. 98). He goes on to detail benefits to the physician, naturalist, and politician. In these fields it is impossible to discuss or make judgments upon individuals without using comparisons of a perceived 'normal' condition, which of course is reflected in the average man. The statistics Quetelet gathered have great historical significance. Doctors, criminologists, and anthropologists could analyze records of the physical properties of man. Biological variations suggested various means of identification. Quetelet provided the foundations for a deterministic criminology that was subsequently adopted by Lombroso who emphasized biologism and mental hereditarianism (Beirne 1987, p.1140). Registers of mental traits were used in the first studies of experimental psychology and later also in the science of education. All moral statisticians could access this type of data to aid the inductive study of social life.

In describing the average man, Quetelet felt it important not to concentrate exclusively on the mean of a scale of distribution. The upper and lower limits of a scale of given characteristics between which individuals fluctuated should also be analyzed. The average man fell at the mean and any insignificant variation around this was felt to be 'natural.' There were some remarkable variations such as 'giants or dwarfs' (1842, *Treatise* p. x). Quetelet perceived these huge deviations as being 'monstrosities.' He felt that it was important to differentiate between the 'extraordinary or preternatural' (1842, *Treatise* p. x). In addition, Quetelet felt that the variation around the mean occurred not randomly but in a steadfast order that gave shape to a normal distribution or bell curve (1842, *Treatise* plate 4) as in geometry. The first serious attempt to apply the normal distribution to social matters was made by Quetelet. The average man fell between the two extremes of deficiency and excess. He displayed 'rational and temperate habits, more regulated passions, and foresight, as manifested by investment in savings banks' (1842, *Treatise* p. 78).

Quetelet uses the comparisons between 'industrious and prudent people... over a depraved and indolent one' (1842, *Treatise* p. 41) to aid decisions about general causes of social events.

Using the *average man*, Quetelet attempted to establish norms for various types of social actions, for example: suicides, crimes, and marriages. He sought to determine the average number that would occur under given conditions during a period of time. These norms formed statistical regularities. He found that in a series of years the number of suicides, crimes or marriages would vary about their average, showing a tendency for the average number to be repeated year- to- year. Quetelet referred to these regularities as Sociological laws. He felt it would be possible to correlate a given phenomenon under investigation with certain physical and social conditions, by showing variations in numbers as the conditions changed.

Throughout his work Quetelet held to the notion that there was no such thing as a chance event. All phenomena were 'caused' and related. If events have causes that persist through time periods, then the same events can be expected to reoccur. Quetelet felt that 'so long as the same *causes* exist, we must expect a repetition of the same *effects*' (1842, *Treatise* p. 6). General social conditions influencing the greater part of the social group result in sufficiently constant social phenomena. The study of large numbers suggests that general causes dominate the numerous influences of trivial ones: 'The greater the number of individuals, the more the individual is effaced and allows to predominate the series of general facts which depend on general causes according to which society exists and is maintained' (1831, *Crime* p. 69). This 'doctrine of probabilities' is the essence of Quetelet's statistical analysis.

It follows from this principle that society will produce a social '*budget* which we pay with frightful regularity' (1842, *Treatise* p. 6). Social conditions act upon man in an overwhelming manner so it is society as a whole that should be held responsible and not the individual: '*Society prepares the crime, and the guilty are only the instruments by which it is executed* ... His crime is the result of the circumstances in which he is found placed' (1842, *Treatise* p. 108).

This position gave Quetelet the reputation of a materialist and fatalist. It is a charge that he constantly defends: 'Ye philosophers and priests. . . you are fatalists, because you believe yourselves predestined to influence man in the exercise of his free-will'. Quetelet then suggests that 'the same finger which has fixed limits to the sea, has set similar bounds to the passions of men' (1842, *Treatise* p. vii). Determinism is often scorned for its association with atheism. However, Quetelet is a religious man; his work displays many theological references. His determinism could be influenced by a belief in God's dominance over the great scheme of human activity. He warns that to argue that the human species is not subject to laws 'would be more offensive to the divinity than the very research which we intend to do' (1931, *Crime* p. 5).

In Quetelet's scheme it appears that the scope of individual freedom is sparse. At times it appears that free will, as a notion is totally absent. Occasionally, however, it is mentioned as an unstable element that 'exercises itself within indefinite limits, if one wishes not to incur the reproach of denying it altogether' (1842, *Treatise* p. vii). In this view, man is capable of an infinite diversity of acts but no single act will upset the general rules or 'laws' of social organization. Any causes an individual will produce are haphazard; such causes will be counterbalanced when a social group is viewed, in the same way that accidental errors would be eliminated if 100 people measured a 10-metre pool.

Despite this determinism, it is hard to classify Quetelet as a fatalist. He considered his work as a tool for social reform. Man could improve his own condition by his own efforts and 'meliorate the future condition of his race' (1842, *Treatise* p. x). Quetelet did feel that man had the ability through moral force to impact natural forces, albeit slowly. Man is capable of exercising reason and knowledge in controlling social institutions. Since correction of effects must begin with a correction of causes, improvement of social conditions will begin with reform of social institutions. Quetelet thought that it was the job of social statistics to make clear social effects traceable to special institutions. Consequently 'it is the province of the legislators to ascertain these causes and to remove them as far as possible' (1842, *Treatise* p. 108).

Quetelet's study of social phenomena employs scientific method. He developed this method for the social sciences. Often it had been reserved for the natural sciences. He looks at causal relationships. It must be determined that there is a relationship between two variables, temporal precedence, and non-spuriousness. When recording statistical regularities, he noticed that in much the same way as death rates, suicides, births and marriages did not vary greatly from year to year. If fluctuations did occur, it was because of a variation in the cause of an event. For example, economic crisis may contribute to an increase in crimes against property. Within a phenomenon, each individual person studied would vary about the mode or mean. The location of each individual will be determined by the combination of causes that would determine their personality and integrity. These causes will be both genetic and environmental, for example religious belief and education. In this way, Quetelet acknowledges a human's 'free will': 'man who, in the social state, reacts on himself by virtue of certain forces which he has at his command from his free will' (1831, *Crime* p. 3). However, 'free will' as a concept is confined to a scientific model determined by causes.

Quetelet explains that no particular individual can be free from the mass and the 'laws' that govern him or her. Counting repetitions of a frequently occurring social act, for example, suicide, forms a law. This is done during equal periods of time in a population group. From this data we can predict that there may be a high

probability that a certain group will show roughly the same number of suicides in a following year. However, it is impossible to say which individuals will be responsible for these actions. This is because a scientist will remain unenlightened as to any exact cause within a combination of causes which influence each individual. This does not in any way discredit the scientific model; we can generalize for the group but cannot speculate how much of any independent variable(s) will influence any particular individual.

Contemporary theorists have commented that 'Quetelet's observation of statistical regularities failed to prove the existence of any laws of human behavior because he did not have a theoretical framework' (Tomasi 2001, p.385). This criticism is rather harsh. With hindsight, it could be suggested that Quetelet seemingly made little attempt to establish all plausible connections between statistical phenomena and social reality. However, at Quetelet's time of writing there was not a sufficient empirical base of theory to clearly determine which causes needed to be allowed for. Therefore, Quetelet relied largely upon his own observations and intuition.

Additionally, statisticians have attacked Quetelet's crude analysis of variance (Stigler 1986, p.173-81). He did not combine measurements taken under a variety of conditions into one analysis. Quetelet's most advanced analysis involved relations across variables such as male height across age. It is suggested that this primitive technique prevented Quetelet from 'any practical quantification of certainty' (Stigler 1986, p.174). Again, this type of criticism is stern. Quetelet never had access to a fixed method, such as a two-way analysis of variance, to determine whether or not he had made a meaningful comparison. He was innovative in suggesting quantitative relationships with the tools that were available to him.

It seems that Quetelet viewed the regularities he observed in social laws as comparable to the laws in the natural sciences. He felt that 'The average man, indeed is in a nation what the center of gravity is in a body' (1842, *Treatise* p. 96). Throughout his work Quetelet makes reference to 'social physics.' It was the subtitle of the 1835 publication of *Sur l'homme et sur le developpement de ses facultes, ou Essai de physique Sociale*. This term suggests that viewing large groups of people is similar to viewing physical facts. These 'social physics' will 'present laws quite as admirable as the mechanics of inanimate objects' (1831, *Crime* p. 4).

It would appear an overstatement to equate social sciences with the natural sciences in the exact fashion Quetelet proposed. In the natural sciences conclusions have a high degree of certainty. A sequence of events can be fully deducted and causes and effects relating to definite conditions may be isolated. The variables involved will usually be simple. In the statistical study of social phenomena the conditions under investigation are usually complex and irregular. It is more difficult to isolate effects of particular causes and relate them to future events. When we do, our margin of error will be far higher than in the natural sciences. The SPSS

statistical software commonly used in social science today uses R squared to show strength of association between variables. In social science an R squared of .8 would be considered magnificent. In the natural sciences an R squared of less than .99 is frowned upon.

When existence and sequence are demonstrated between a variable and the conditions from which it arises we observe a ‘social law’. However, this social law will not be as precise in form as a natural law. We can never establish exactly the strength of any one influence necessary to produce an event or the proportions which exist if there are a number of antecedent conditions. We could speculate, for example, that reports of suicides in the media influence suicide rates by way of imitation. However, if we formulate a hypothesis ‘media coverage increases suicide rates’, we will make this statement with a high margin of error. This is because we can not totally isolate media influences from other influences: social economic conditions, identification with a religious group, and changes in family structure.

Additionally, our rates will change from decade to decade because of changes in the conditions determining them. The social laws derived from regularities in social statistics will never become sufficiently general to be independent of time and place. Just as laws of mortality change with technological advances, any social phenomenon studied will change alongside the conditions that provoke it. Unlike natural science, social science is dynamic. Social laws derived through correlations of statistical fact can have considerable scientific value but their inferences have a lesser degree of confidence.

Despite this exaggerated equation between the natural and social sciences, Quetelet’s findings were never redundant. He considered his work as a tool for social reform. Statistically identifiable laws should be used to stimulate the most effective means of public reform. This is very clearly demonstrated in his research on crime statistics. Crimes tend to reflect the social condition of the community and comparisons of conditions can be made with respect to different times and places. He found crime rates to be high in areas that demonstrated great inequalities of wealth, where individuals had a ‘continual view of luxury and an inequality of fortune which disheartens them’ (1831, *Crime* p. 38). These findings would much later be developed in Marxist criminology. Indeed, Marx himself had read and was influenced by Quetelet. Marx used the concept of the average man from *Physique Sociale* in explaining the labour theory of value (*Capital, Volume One*, 1867 p.341). Marx wrote in the *New York Daily Tribune* that *Physique Sociale* was “an excellent and learned work” (1853, p.229).

Quetelet’s crime statistics also showed that crime rates were related to the type of education available and the presence or absence of ‘moral instruction’ (1831, *Crime* p. 37). However the most influential factors were age and sex. His statistical table (1831, *Crime* p. 56) shows that a disposition for criminal behavior was at its

strongest between the ages of 21 and 25. Other tables (1831, *Crime* p. 47) demonstrate that, between 1826 and 1829, there were 23 women for every 100 men who appeared before criminal tribunals. Quetelet was able to establish such influences and model them into a formal causal structure. This work was unique for his time; prior to this there had only been wild speculation about criminals. Quetelet felt that people would be able to use the type of social knowledge he discovered for the betterment of society.

According to Quetelet, men and women ‘possess[.] a moral strength capable of modifying the laws which concern [them]’ (1831, *Crime* p. 69). Quetelet was optimistic that simply decreasing the potency of their causes could reduce disturbances to society such as crime. This was the job of the legislators and, although they could not prevent all crime, there could exist ‘an ensemble of laws, an enlightened administration and a social state such that the number of crimes can be reduced as much as possible’ (1846, *Letters* pp. 357-58). Quetelet felt that the state should pursue two policies towards crime. Firstly they should take action to combat and incapacitate the minority with criminal tendencies. Quetelet suggests that this reaction should involve adherence of principles to a criminal code, the constant detection and prosecution of criminals, uniformity in the decisions of juries and judges, and the maintenance of a proper relation between the gravity of the offence and the punishment awarded it (1846, *Letters* pp. 356-57). Secondly, the state should encourage the cultivation of the moral and intellectual tendencies of average man. Laws could be enacted to reduce disturbances in the social equilibrium. ‘The more do deviations from the average disappear . . . the more, consequently, do we tend to approach that which is beautiful, that which is good’ (1842, *Treatise* p. 108).

Florence Nightingale identified Quetelet’s social *laws* as the essential answer to the amelioration of social life. She proposed a uniform plan for keeping hospital statistics. The value of different methods of treatment used could be ascertained by examining data on mortality and duration of disease. Nightingale felt that trustworthy data could guide future experience and develop models of intervention (McDonald 1998, *Theorists* p. 180). Quetelet became her mentor. Her eulogy shows how important she rendered his work to humanity. She thought Quetelet to be, ‘the founder of the most important science in the whole world, for upon it depends the practical application of every other’ (McDonald 1994, *Founders* p. 190).

Quetelet was not without critics. As already mentioned, he was considered by some as fatalistic, materialistic, and anti-spiritual. His creation of an ‘average man’ also raised objections. It would be hard to imagine such a construct. Taking averages of traits such as beauty, ugliness, intelligence, stupidity, strength, weakness, courage, and cowardliness would leave us with a human who clearly was a muddle. Human qualities occur in varying degrees in all individuals of a given type. Durkheim greatly admired Quetelet’s work on regularities in social phenomena and used many

of Quetelet's observations as examples in his work. However, he failed to believe that 'average man' could in any way explain these statistical recurrences. In *Suicide* (1897) he reasoned that any given characteristic would occur in the average man, 'only in a very dilute state, precisely because the number of individuals among whom it is distributed is far greater than it should be' (p. 304). If, 15 from 100,000 kill themselves it 'does not imply that the others are exposed to any degree' (p. 304).

Durkeim's reasoning is accurate although it takes the concept of an average man very literally. The average is *not* sufficient to represent a group. Significant changes may occur in the limits of distribution, or in the standard deviation of the group measurements without affecting the average. An average does disregard the complicated internal distribution of actual individual human qualities. However, it appears that Quetelet fabricated the concept to use as a yardstick with which to make comparisons of deviations from the 'normal' when studying any one particular quality. He was aware that no individual in his or her complexity would exist as such a character.

The *average man* is the center of Quetelet's general statistical conception of the universe. Everything varies about a normal state, demonstrated by bell-shaped curves, symmetrical in shape but variable in range. The individual varies about his normal self. Members of a group vary about their average. Citizens of a nation vary about the average of the nation. Lastly, the average man could be compared through a multitude of nations. To Quetelet this is a conceptual model only. The qualities of each average man will vary across time and place because of variations in the general causes of these qualities. Quetelet thought: 'This mean varies among different people, and sometimes even within the limits of a single country, where two people of different origins may be mixed together' (1846, *Letters* p.96). As Durkeim suggested, average man will never exist as an entity but as an invented measure.

Although not without criticism, Durkeim was very free in recognizing Quetelet's accomplishments. The achievement that he feels is perhaps the most fundamental is Quetelet's methodology. In *The Rules of Sociological Method* (1903), Durkeim traces Quetelet to the emergence of an autonomous sociology intent on opposing methodological individualism:

Social phenomena could no longer be deemed the product of fortuitous combinations, arbitrary acts of the will, or local or chance circumstances. Their generality attests to their essential dependence on general causes which, everywhere that they are present, produce their effects . . . Where for a long time there has been perceived only isolated actions, lacking any links, there was found to be a system of definite laws. This was already expressed in the title of the book in which Quetelet expounded the basic principles of the statistics of morality (pp. 201-2).

Quetelet was a pioneer in pointing to the existence of regularities in social phenomena. His contemporary, Comte, may have been the first to use the word 'sociology' but Quetelet was the first to formulate a sociological method of investigation. Previously, science was limited to results induced from single observations. However, regularities can only be observed from making a large number of observations. In Quetelet's work we can find the underlying reasons for the extensive usage of quantitative methodology in sociology today.

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