JPDA: Just Plain Data Analysis
(formerly, Teaching Practical Data Analysis Skills)

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With the Perestroika revolution of recent years, the discipline of political science has seen a resumption of the battles waged during the behavioral revolution of the 1950’s. While the Perestroikans have pursued the cause of methodological pluralism (a concept laden with many meanings in the writings of political scientists), those on the hard science side have struggled to find a unifying methodology for the discipline that would be worthy of the hegemonic position the Perestroikans decry. Among the most recent attempts have been Gary King’s likelihood theory (1989), King and Keohane’s effort to bridge the gap between quantitative and qualitative research (1994) and the development of the “Empirical Implications of Theoretical Models” (EITM) approach designed to encompass both quantitative and rational choice methods (National Science Foundation, 2002).

What most of this debate misses, however, is that there is a quantitative political science methodology, at least a century old, common to almost every field of political science, practiced by political scientists in academia, government and the private sector, and found in most of the political science textbooks and in much of the most-read literature in the discipline. I call it Just Plain Data Analysis (JPDA). JPDA is the methodology that unifies political science.

What is JPDA?
JPDA is, simply, the compilation and presentation of numerical evidence to support and illustrate arguments about politics and public issues. Although JPDA is the most common form of quantitative analysis in the discipline, it involves skills that are rarely taught in political science research methods courses, including some skills that that many practicing political scientists have yet to master. Nor is it taught in qualitative methods courses.

JPDA differs from what is commonly regarded as quantitative political science methodology in that it usually does not involve formal tests of theories, hypotheses or null hypotheses. It abjures measures of association and statistical significance. Rather than relying on statistical analysis of a single dataset, JPDA -- at its best -- involves compiling all the relevant evidence from multiple data sources. A guiding principle is that the purpose of a statistic is to simplify. Any single statistic is a numerical measure an attribute of a larger set of numbers.

As an analogy consider the difference between a DNA expert analyzing a piece of evidence for a trial and the attorney who seeks to compile all the evidence to make a case. The DNA expert uses hard science to reach a narrow conclusion. The attorney uses reason, inferential logic and evidence to make a case.

Falling somewhere between quantitative methodology and qualitative methodology, plain data analysis is found throughout almost all fields of political science (political theory and constitutional law being primary exceptions), most prominently in books written for broad audiences and also in the great majority of the discipline’s textbooks. It is the primary mode of quantitative analysis in
policy analysis, the kind of policy analysis government employees do all the time. In the realm of policy analysis JPDA often serves as a bridge between hard quantitative science and qualitative research. Thus, Stephen and Abigail’s Thernstrom’s *No Excuses*, a plain data analysis of education policy, bridges the regression-based analyses of the effects of school resources on educational achievement (e.g., the Coleman Report) and Jonathan Kozol’s qualitative analysis in *Savage Inequalities.*

And JPDA is the only way to address many of the empirical questions political scientists deal with in their research, particularly questions concerning social and political trends, such as:

- Are the rich getting richer?
- Is social capital in decline?
- How big is the gender gap?, or
- How much control does hard science have over the discipline’s journals?

**Table 2**

Methods in APSR 1965–2000

This last question is central to the Perestroikan’s critique of hard quantitative political science and it is a question they address using numerical data. Thus Perestroikan sponsored symposium in the American Political Science Association’s newsletter-journal, *PS, Political Science and Politics* contained 5 essays decrying the hegemony of quantitative research (and its companion non-quantitative formal modeling). And each supports its argument with reference to quantitative data derived from systematic empirical surveys of the discipline’s journals and graduate program curricular requirements. The results are presented bar charts and time series charts (Bennett, Barth, and Rutherford 2003, 375-6) and tabulations (Shwartz-Shea 2003, 380-5) and in textual discussions, such as this from Yanow (2003, 397):

"From 1991–2000, research based on statistics and modeling accounted for 74% of all published articles (53% and 21% respectively), political theory garnered 25% of journal space, and qualitative research captured 1% (one article each in 1992, 1993, 1995, 1996, 1997)."

Clearly, Perestroikans are not opposed to the use of quantitative data per se, it must be something else that has them so upset.

**Figure 1: Perestroikan Data Analysis**

"From 1991–2000, research based on statistics and modeling accounted for 74% of all published articles (53% and 21% respectively), political theory garnered 25% of journal space, and qualitative research captured 1% (one article each in 1992, 1993, 1995, 1996, 1997)."
Examples of JPDA in political science:
Just plain data analysis has a long tradition in political science and it was essential to what political scientists meant when they first used the term "science" to define what their discipline was all about.

![Figure 2: Allen (1906)](https://example.com/figure2.png)

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<th>Prohibition</th>
<th>Populist</th>
<th>Socialist</th>
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<td>17 .13</td>
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<td>70 3.33</td>
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<td>68 1.1</td>
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<table>
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<td>26,973</td>
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</table>

Figure 2: Allen (1906)

Perhaps the first analysis of the impacts of technology on elections was Philip Loring Allen's 1906 study of the effects of variations in state balloting procedures. Allen developed measures, still in use today, of split-ticket voting and what would later be called "roll off" to evaluate the fairness and reliability of a variety voting procedures. Figure 2 is a part of a table that Allen uses to measure the differences in the votes for the top and bottom electors of political parties in states using straight-ticket and single-elector ballots.
Figure 3: The Changing American Voter (Nie. et. al. 1976)

Much of the earliest “hard” quantitative research in political science involved analyses of American voting behavior, made possible by the availability of the American National Election Surveys and the development of the computer equipment and software used to analyze them in the 1960s and 1970s. One of the classic studies of American voting behavior The Changing American Voter (1976), an excellent example of just plain data analysis, summarized previous quantitative analyses and defined the context for much of quantitative research that was to come later. The high quality of the tabular and graphical representations of data in the book -- at a time when charts and graphs were done by hand -- demonstrates that computer software is not a prerequisite for good graphic design. And, as the next example shows, graphics software often leads really poor charts.
Robert Putnam’s Bowling Alone (2000), a work that has probably inspired more hard-science analyses across more of the discipline’s subfields than any other piece of political science, is another good example of plain data analysis. Almost all of Putnam’s analysis is grounded in some kind of presentation of quantitative data, from a wide variety of sources, and presented in charts and graphs. Putnam describes his strategy as attempting to “triangulate among as many independent sources of information as possible” based on the “core principle” that “no single source of data is flawless, but the more numerous and diverse the sources, the less likely that the could all be influenced by the same flaw” (415). Although almost all of the data are based on public opinion surveys, the data presentations rarely require the use of measures of statistical significance and are presented as illustration of the general theory rather than statistical tests of hypotheses.

Unfortunately, Putnam’s graphics leave much to be desired; many, if not most, of his figures violate fundamental principles of graphic design. In the example above (figure 3), the addition of trendlines hide the real data; many of his other figures use unnecessary 3-D effects and several graphs (see Putnam’s figure 47) are used for data that should be presented in tables.

The advantages of JPDA over conventional regression-based quantitative analysis is illustrated in one of the most contentious scholarly disputes in political science, concerning the salience of racism to American political behavior. The work of the two lead authors in the dispute, Donald Kinder and Paul Sniderman, follow two strikingly different research paradigms. Kinder and his coauthors (who argue that symbolic racism and racial resentment play a major role in white voting behavior) typically follow the hard science approach, using factor analysis to measure symbolic racism and regression models to measures its effect on other policy choices. On the other side, Sniderman and his co-authors (arguing that white voters’ policy preferences are not primarily a manifestation of racism), consistently follow a softer approach.
Sniderman’s work typically follows a strategy of finding, compiling and presenting all the quantitative evidence that he can find to illustrate and elaborate his overall theory. Thus, with a simple bar chart, Sniderman shows that in the case of one of the questions Kinder uses to measure racial resentment, blacks and whites have almost identical responses; and both blacks and whites respond to the question in the same way when the question is reworded to measure hostility to European immigrants instead of blacks (see figure 5).

(Note how the absence of any measure of association or statistical significance in figure 5 detracts not one bit from the analysis of the data.)

Although both approaches have their role, Sniderman’s methodology illustrates many of the advantages of JPDA. Here the theory drives the data collection, and the constraints of the single dataset do not force the representation of a theory in a regression model. The analysis is accessible to a broader audience and the assumptions underlying the analysis are transparent.

Teaching JPDA.

Doing JPDA well involves an appreciable set of skills and, although JPDA is the most pervasive form of quantitative political science analysis, it is generally not taught to students in research methods courses. Six basic skills are involved:

- Familiarity with key political science indicators.
- Finding meaningful data.
- Constructing appropriate indicators.
- Assessing data reliability and validity.
- Analyzing relationships.
- Data presentation skills
- Using spreadsheet graphic software.

The traditional approach to the introductory statistics course often treats issues of operationalization and measurement as mostly a choice between nominal, ordinal and interval level of measurements and tends to gloss over things that students find very problematic. If students are to make any effective use of quantitative data in their own research, they first must be familiar with the use of fundamental political and social indicators of political science writing and they must know where to find the best kinds of data to address their research questions.

Familiarity with key indicators.
In the fields of economics, psychology and education there are fundamental statistical indicators that all students should be familiar with. So, too, in political science. Loosely, these measures fall into three categories: political, economic, and public policy. The key political indicators would include measures of voter turnout, political poll data such as the Gallup presidential approval measure and the transparency index. Economic variables would include measures of economic development and quality of life, government expenditures, national debt and deficit, income and wealth inequality, poverty and unemployment. Finally students should be familiar with the use of at least some key policy performance indicators such as measures of education achievement (NAEP scores), or crime rates.

For example, consider the data shown in figure 5, a time-series trend of US Federal budget surpluses and deficits (OMB 2005). A political science student ought to know or be able to figure out: a) where to get these data, b) that the years represent fiscal years, c) that president Bush's first deficit is represented by the FY 2002 data, and d) that the estimates of declining future deficits are probably wishful thinking. Most importantly, a student ought to be able to use these data in a coherent argument about presidential administrations and fiscal policy.

And he or she should know that other data might lead to different conclusions: using a GDP deflator would not exaggerate the current administration's deficits as this measure does, and there are advantages to using measures of annual change in the total federal debt instead of deficits.

Finding meaningful data.
Students should have a general idea of the wide range of political and social indicator data that is available, almost all of it now, through the Internet. Students who will take courses in comparative politics and international relations ought to be familiar with OECD, World Bank and UN data. Those who will take American government, public policy and public administration courses ought to be familiar with the data available through the various federal government statistical agencies such as the Bureau of Justice Statistics, the National Center for Educational Statistics, and the Bureau of Labor Statistics. Students who take courses in areas related to gender, racial and ethnic inequality ought to be aware of the sources of data commonly used in the research and debates over the policy issues these courses addresses. They should be able to access on-line survey data, particularly resources that provide time series polling trends. They should understand how the Census works, both the decennial census and the Current Population Survey.
Time series public opinion data are essential to many political analyses. Unfortunately many major polling websites – Zogby, Rasmussen and Gallup -- require subscriptions to access their best data. Fortunately, using a web interface, it is possible to access time series crosstabulations from both the American National Election Survey and the NORC General Social Survey.

In my own course, I provide the students online access to the most recent version of the US Statistical Abstract CD-Rom. The CD-Rom contains pdf files of the entire Abstract, but also a spreadsheet data file for each table in the Abstract, and these files often contain much more data than is shown in the printed copy. In addition, each table is accompanied by an internet link to the original source of the data – usually a US government agency statistics website. As such, the CD is one of the best places to go to initiate as data search on many political science topics.

Finding reliable cross national data is a bit more problematic. The OECD is an excellent source for political, economic and social indicators for developed nations, although some of their data require subscription. United Nations, World Bank and other sources of data for developing countries are often more difficult to access.

Some statistics sites, such as the Bureau of Transportation Statistics, the NCES’s National Assessment of Educational Progress (NAEP) Data Tool and the OECD’s SourceOECD provide data portals that permit users to extract data in a variety of formats from larger databases. The portals, however, require a level of familiarity with the data definitions that is beyond the novice user.

**Constructing appropriate indicators.**

Choosing the right statistical measures is a skill that often comes so naturally to statisticians that they do not appreciate how problematic it can be for students.

Traditional methods courses often cover the problem students have with Crosstabs percentaging: Do you use the percentage of men who voted Democratic or the percentage of Democratic voters who are men? But interpreting social indicator data often involves issues that are not covered: What's the difference between an abortion rate and an abortion ratio? What does it mean to index two different time series trends to an initial value of 100? What's the difference between a

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1 The ANES website provides demographic breakdowns of key many variables, the NORC website permits actual crosstabulation.
ANES: [http://www.umich.edu/~nes/nesguide/nesguide.htm](http://www.umich.edu/~nes/nesguide/nesguide.htm)
percentage change and a net change in a percentage? Students should understand that a statement that “unemployment has gone up ten percent” can mean several different things.

Students need to be shown that percentage, mean, rate and ratio measures (or “per capita” and “% of GDP”) are better than aggregate totals (e.g. to use the murder rate rather than the number of murders across cities). The Center for Disease Control and Prevention has developed a useful three stage framework, “Count, Divide, and Compare” that serves as an excellent heuristic for for teaching social indicator analysis.

Assessing data reliability and validity.

Assessing the reliability and validity of statistical measures, and understanding the distinction between these two standards of measurement is a critical quantitative competency. Among the things not stressed when textbooks address measurement reliability and validity is an understanding how the data were originally collected and by whom. For example, in the U.S. two different measures of the crime rate are commonly reported: The National Criminal Victimization Survey data and the rates from the FBI’s Uniform Crime Reports. Knowing that the later is based on reports to and from local police agencies and the former is based on a personal household survey is critical to the use of these data. There are at least five different ways to measure US voter turnout (and the measure derived from the American National Election Studies is the least valid or reliable). Students should be able to evaluate the various measures and assess their applicability to specific research questions. The use of common economic indicators used in policy analysis, such as poverty and unemployment rates, require a good understanding of how the indicators are constructed and the measurement issues involved in their interpretation.

Figure 7: Five Measures of voter turnout

Sampling error is but one of several aspects of measurement reliability (it can be treated as a matter of both measurement reliability and as an aspect of a study’s external validity, discussed
below). It tends to be over-taught in research methods texts to the detriment of a great many other sources of measurement unreliability such as response rate, differences in question wording or methods of data collection, and the use of sampling adjustments as in the case of surveys of “likely voters”. And for the vast majority of political science applications, a simplified sampling error former suffices quite nicely:

\[
\text{s.e.} = \frac{1}{\sqrt{N}} \times 100
\]

**Analyzing relationships.**

Donald T. Campbell’s (1969, Campbell and Ross, 1970) threats to internal and external validity provide an excellent framework for the analysis of graphical representations of causal relationships. The principles apply equally well to experimental, quasi-experimental, and nonexperimental research designs. Although Campbell originally presented these concepts in the context of quasi-experimental design, the principles serve as well for evaluating data derived from pure experiments (only external validity is at issue there) and in evaluating nonexperimental regression analyses.

Simpson’s paradox and ecological fallacy are forms of internal and external invalidity\(^2\) (respectively) that are not addressed in the Campbell framework deserve additional attention.

**Presenting data.**

Many political science research methods texts have a section addressing graphical display of data, often showing how data are displayed in bar charts, pie charts and scattergrams. Few even begin to address fundamental principles of graphical display, even though it is a political scientist, Edward Tufte, who has done the most to articulate them.

The past two decades have seen the development of a substantial literature on the art and science of data presentation, much of it following Tufte’s *The Visual Display of Quantitative Information*, (1983). With his admonitions to “show the data,” “minimize the ink-to-data ratio,” avoid “ChartJunk”, Tufte established many of the basic rules and principles of graphical design, stressing the graphical minimalism in data presentation. Howard Wainer (1984, 1996, 1997) extends Tufte’s minimalist standards, with a somewhat greater focus on tabular displays of data. Wainer is most insistent on the importance of appropriate data sorting, condemning “Austria First!” and “Alabama first!” data presentations. William Cleveland (1985) is a more scientific treatment of the display of science data that summarizes much of the research on the visual perception of graphic representations.

Although it deals primarily with business applications, Stephen Few’s *Show Me the Numbers* (2004) is the most thorough guide to the principles of tabular and graphic display and provides excellent coverage of Excel graphics options. Jane Miller’s *The Chicago Guide to Writing about Numbers* is also an excellent resources for all kinds of numerical presentations.

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\(^2\) Depending how you think about it: ecological fallacy could also be considered an issue of internal validity.
Students should be instructed in four general principles of data display: clarity, meaningful comparison, truthfulness and efficiency. Clarity stresses that each data element of a chart or table ought to be defined unambiguously. Meaningful comparison, that a display ought to make a significant point. Truthfulness deals mostly with issues of graphical data distortion, such as those famously depicted in Darrel Huff's *How to Lie with Statistics*. The simple hypothetical example shown in figure 8 demonstrates one of the most common graphical distortions.

The efficiency standard is the application of Edward Tufte’s injunction to maximize the data-to-ink ratio: Pie charts are bad. Three-D pie charts, worse. Comparing multiple pie charts, an unmitigated evil. For examples of graphs that consistently violate most of Tufte’s principles, consider most of the charts in David A. Rochefort’s *Quantitative Methods in Practice* (2006), a collection of readings from *PS* meant to serve as a reader for political science methods courses.

Using spreadsheet graphic software.

Most research methods courses teach students how to use SPSS, Minitab or some similar statistical analysis package. Nevertheless, Microsoft Excel is the graphics and statistics package that students are most likely to have installed on their own computers and are most likely to have on their office computers after they graduate.

I teach my course entirely with the Microsoft Excel spread-sheet program even though there are much better graphical software packages available and the Excel data analysis program has serious shortcomings.

Two critical shortcomings of the Excel charting software are the lack of a boxplot chart and a simple method of adding data labels (for example, state codes shown in Figure 9) to scatterplots. These short-comings can be corrected with various macros and add-ins available on the Internet.

The course also covers multiple regression analysis using the Excel correlation and regression procedures available in the “Data Analysis” add-in. Unfortunately, there are many limitations to the add-in: it doesn’t handle missing data; it only does unstandardized
regression analysis, and there are questions about the accuracy of the calculations (Altman and MacDonald, 2002).

Including JPDA in the curriculum.
There are many ways of including JPDA in an undergraduate curriculum. Emphasizing general social and economic indicators rather than focusing on data special to political science, it could be a general education statistical literacy course, as is done at Depaul University (Jabon and Narasimhan, 2002).

JPDA could ALSO be taught as a component of an introductory political science research methods course – I cover the material in the first 9 weeks of a 15 week course that ends with a section on multiple regression – or as a separate course in its own right. In programs where a standard statistics course is taught across the social science departments, JPDA might be included in a separate Introduction to Political Science course. Departments that offer both quantitative and qualitative methods courses should also include JPDA in their curriculum. Departments with terminal Masters or MPA programs training students for government service should also consider requiring JPDA training.

Conclusion:
Just plain data analysis (JPDA) is the most common form of quantitative analysis in the discipline of political science. It involves technical, analytic and even artistic skills and knowledge that are not presented (or not well presented) in most introductory research methods courses or textbooks. Nevertheless these are skills that our students can apply in much their other political science coursework and in their future careers. Moreover, political science research would have much to gain were its practitioners to develop some of these skills.

Although many of the JPDA skills – with the exception of graphical design skills – come naturally to political scientists who practice “harder” forms of quantitative analysis, it would be a mistake to think of JPDA as a simpler form of analysis. In many respects, plain data analysis requires more imagination, knowledge of the subject matter and insight than traditional hypothesis-testing quantitative analysis. In some respects it is more art than science: there are no formulas to memorize and there is no simple set of rules for interpreting the statistical results (for example: Is the t-ratio bigger than 2?). For sure, these are not easy skills for students to master and one should not think of JPDA coursework as an easy out for mathaphobes.

Why JPDA? I thought if I gave it an acronym it might catch on faster.
References


Presenting Data: Tabular and graphic display of social indicators
(under construction)
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Introduction

JPDA: Just plain data analysis

Constructing good tables for the display of social indicators  (revised 6/10/05)

Constructing good charts and graphs
General principles of graphic display
Time series charts.
Bar charts
Tips on using MSExcel to prepare charts and graphs.
How to construct bad charts and graphs

Specific Data Topics:

- Budgets
- Poverty  (new 6/9/5)
- Elections
- Education

The Chart of the Week

References