An Introduction to the Dataverse Network as an Infrastructure for Data Sharing

Gary King
Harvard University

March 21, 2007

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- When storage methods changes, some data sets are lost; others have altered content!

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- In modern democracy: the public needs a direct source of information

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- We will propose technological solutions to these political and sociological problems

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Rules for Citing Printed Matter

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Special formatting codes

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Citations: rule-based, precise, redundant

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Print Citations Work: authors don't think publishers get all the credit; cited articles can be found; copyeditors don't need to see the original to know it exists; the link from citation to print persists

A New Citation Standard for Numeric Data

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- UNF is calculated from the content not the file: Its the Same UNF regardless of changes in computer hardware, storage medium, operating system, statistical software, database, or spreadsheet software.
- Cryptographic technology: any change in data content changes the UNF. (no tinkering after the fact!)
- Noninvertible properties
  - UNFs convey no information about data content
  - OK to distribute for highly sensitive, confidential, or proprietary data
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Web 2.0 Terminology

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- Software: find CD, install locally,

Web 2.0 Terminology

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- Virtual host: Where the web application software *seems* to run, but does not (web sites of: authors, journals, granting agencies, research centers, universities, scholarly organizations, etc.)

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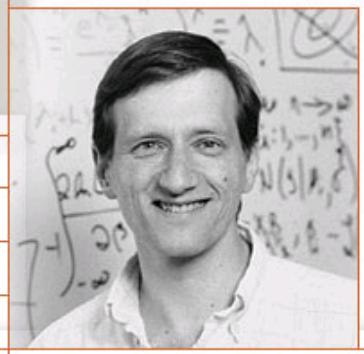

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Gary King is the David Florence Professor of Government in the Department of Government (in the Faculty of Arts and Sciences Harvard University. He also serves as Director of the Institute for Quantitative Social Science. King and his research group deve statistical and other methods for, and conduct diverse applications in, many areas of social science research, focusing on innov that span the range from statistical theory to practical application. For more information, see his short bio and curriculum vitae

King's work can be found categorized by type (recent writings, published articles and books, public presentations, and software alternatively by research areas:

- Causal Inference: Methods for detecting and reducing model dependence (when minor model changes produce substantiv different inferences) in inferring counterfactuals (such as predictions, what-if questions, and causal effects). Matching m "politically robust" experimental design; a causal bias decomposition; software; and applications.
- Data Sharing and Informatics: New standards, protocols, and software for citing, sharing, analyzing, archiving, preservinc distributing, cataloging, translating, disseminating, naming, verifying, and replicating quantitative data and associated ana Also includes proposals to improve the norms of data sharing and replication in science.
- Ecological Inference (Inferring Individual Behavior from Group-Level Data): The original methods that incorporate both uni deterministic bounds and cross-unit statistical information, methods for 2x2 and larger tables, Bayesian model averaging, applications to elections, EI/EzI software.
- Event Counts and Duration Models: Develops statistical models to explain how many events occur for each fixed time per time between events. An application to cabinet dissolution in parliamentary democracies united two previously waring sch literatures. Other applications in international relations, and Supreme Court appointments.

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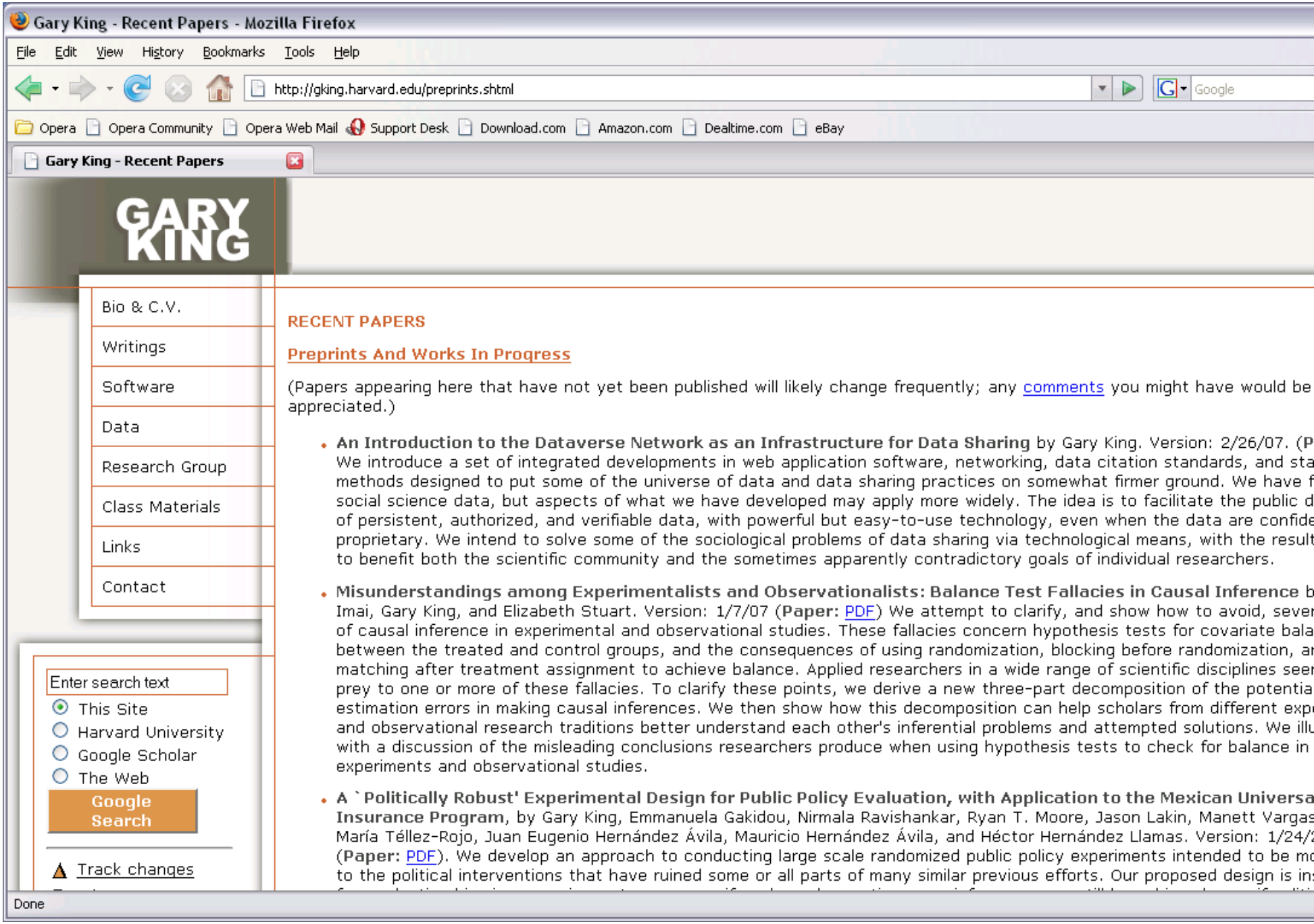
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We introduce a set of integrated developments in web application software, networking, data citation standards, and sta
methods designed to put some of the universe of data and data sharing practices on somewhat firmer ground. We have f
social science data, but aspects of what we have developed may apply more widely. The idea is to facilitate the public d
of persistent, authorized, and verifiable data, with powerful but easy-to-use technology, even when the data are confide
proprietary. We intend to solve some of the sociological problems of data sharing via technological means, with the result
to benefit both the scientific community and the sometimes apparently contradictory goals of individual researchers.
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Imai, Gary King, and Elizabeth Stuart. Version: 1/7/07 (Paper: PDF) We attempt to clarify, and show how to avoid, sever
of causal inference in experimental and observational studies. These fallacies concern hypothesis tests for covariate bala
between the treated and control groups, and the consequences of using randomization, blocking before randomization, a
matching after treatment assignment to achieve balance. Applied researchers in a wide range of scientific disciplines seer
prey to one or more of these fallacies. To clarify these points, we derive a new three-part decomposition of the potentia
estimation errors in making causal inferences. We then show how this decomposition can help scholars from different exp
and observational research traditions better understand each other's inferential problems and attempted solutions. We illu
with a discussion of the misleading conclusions researchers produce when using hypothesis tests to check for balance in
experiments and observational studies.
A `Politically Robust' Experimental Design for Public Policy Evaluation, with Application to the Mexican Universa
Insurance Program, by Gary King, Emmanuela Gakidou, Nirmala Ravishankar, Ryan T. Moore, Jason Lakin, Manett Vargas
María Téllez-Rojo, Juan Eugenio Hernández Ávila, Mauricio Hernández Ávila, and Héctor Hernández Llamas. Version: 1/24/
(Paper: PDF). We develop an approach to conducting large scale randomized public policy experiments intended to be m
to the political interventions that have ruined some or all parts of many similar previous efforts. Our proposed design is in
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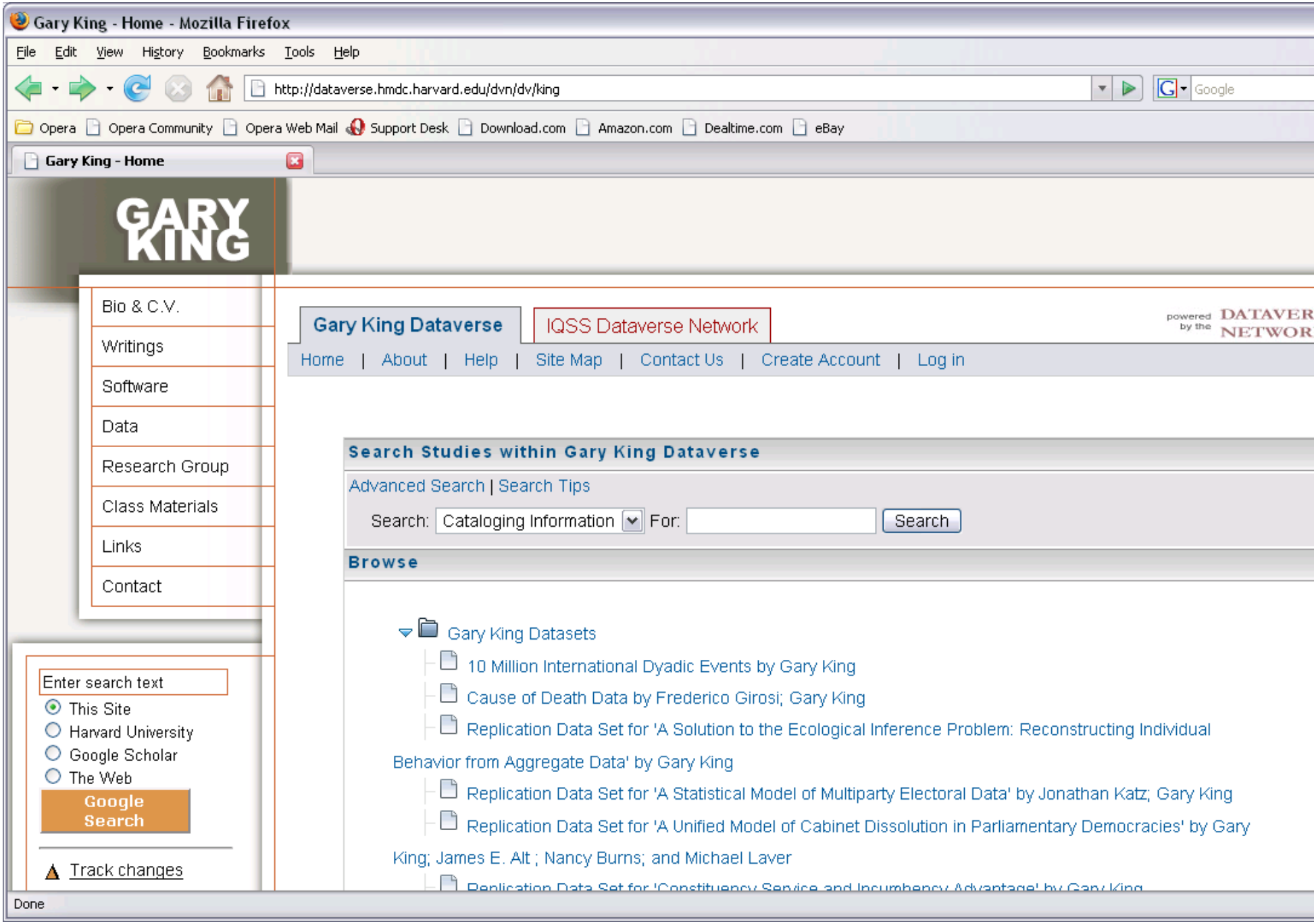
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Replication Data Set for 'A Statistical Model of Multiparty Electoral Data' by Jonathan Katz; Gary King
Replication Data Set for 'A Unified Model of Cabinet Dissolution in Parliamentary Democracies' by Gary
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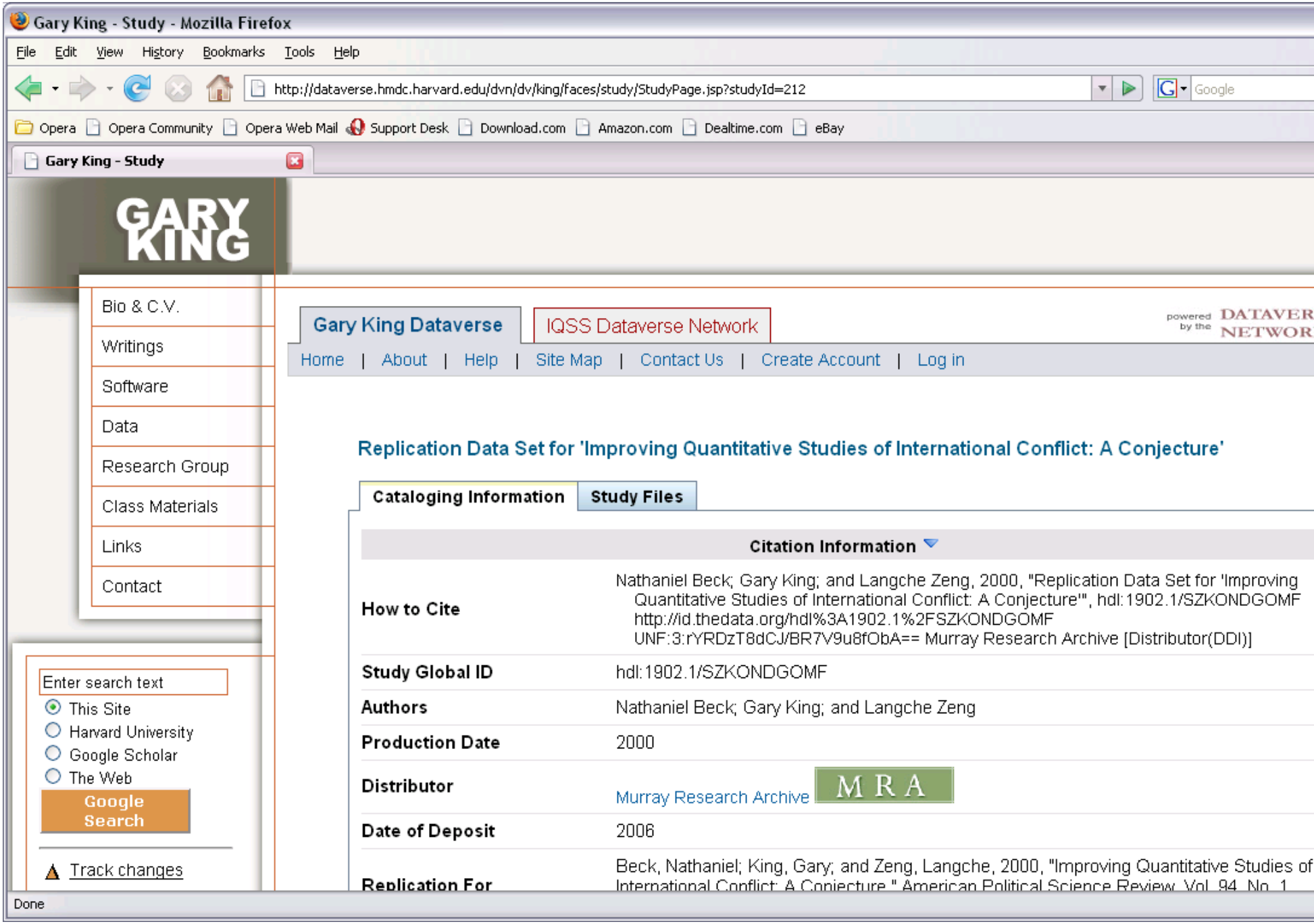
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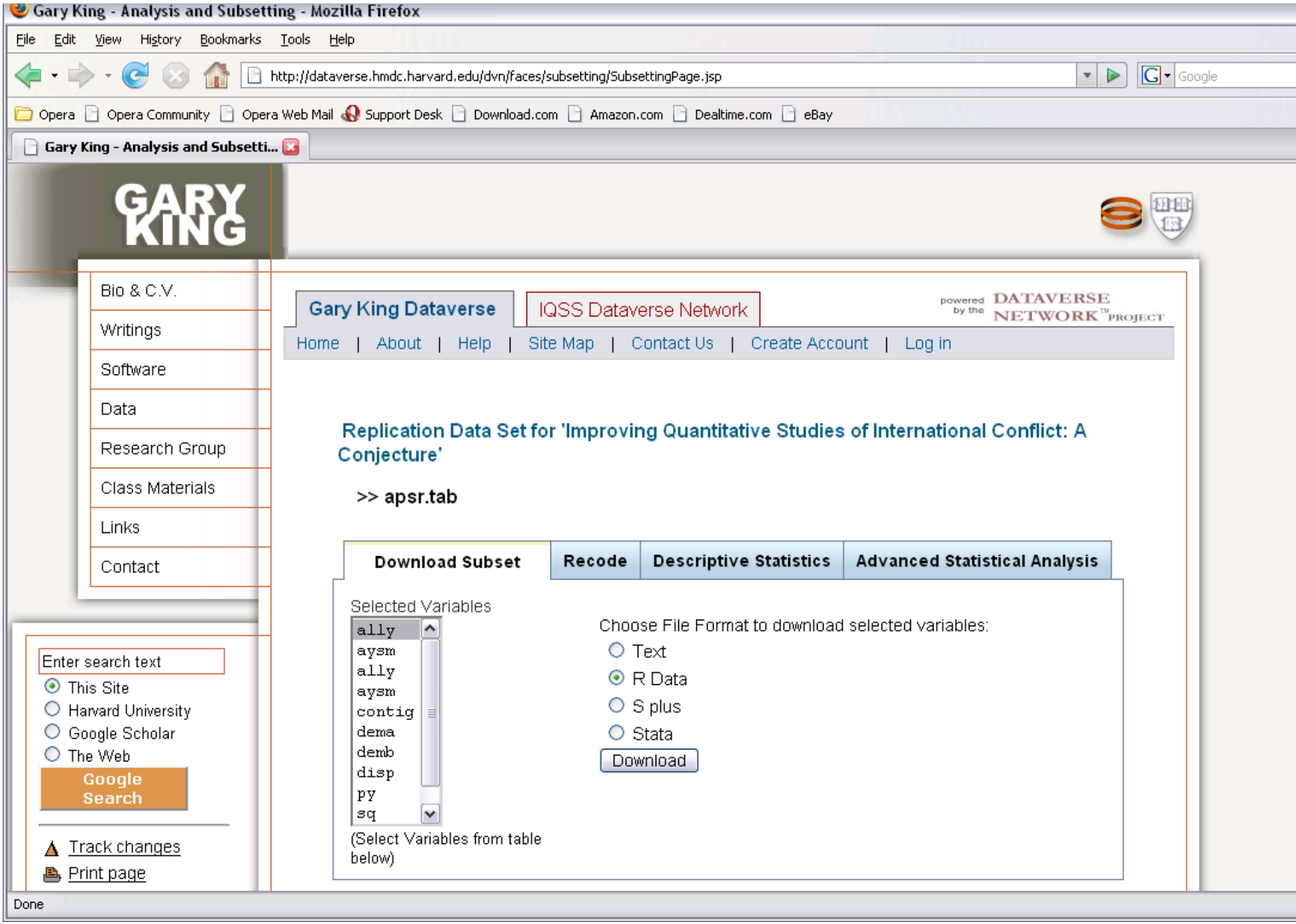
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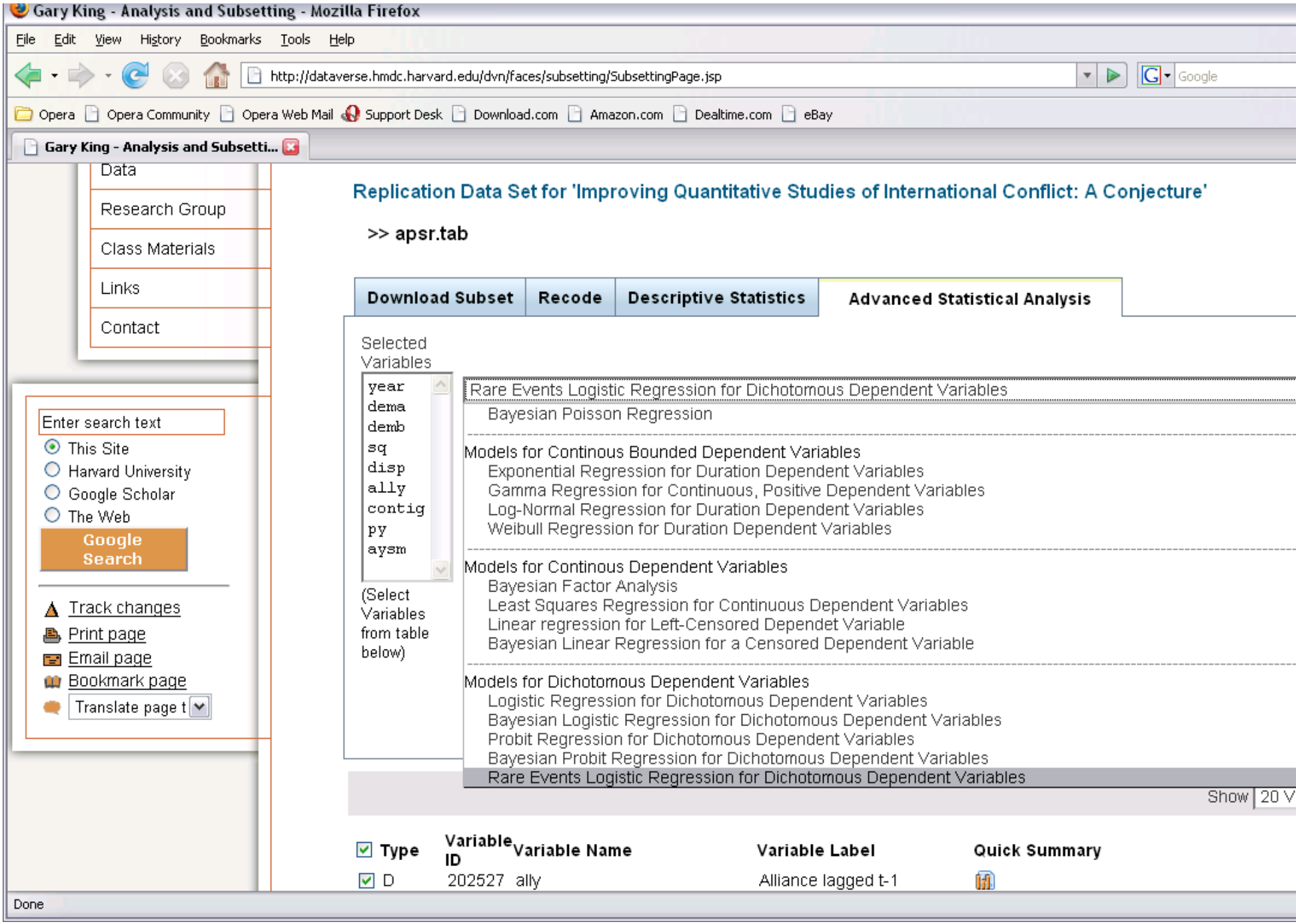
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Bayesian Poisson Regression
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Exponential Regression for Duration Dependent Variables
Gamma Regression for Continuous, Positive Dependent Variables
Log-Normal Regression for Duration Dependent Variables
Weibull Regression for Duration Dependent Variables
Models for Continous Dependent Variables
Bayesian Factor Analysis
Least Squares Regression for Continuous Dependent Variables
Linear regression for Left-Censored Dependet Variable
Bayesian Linear Regression for a Censored Dependent Variable
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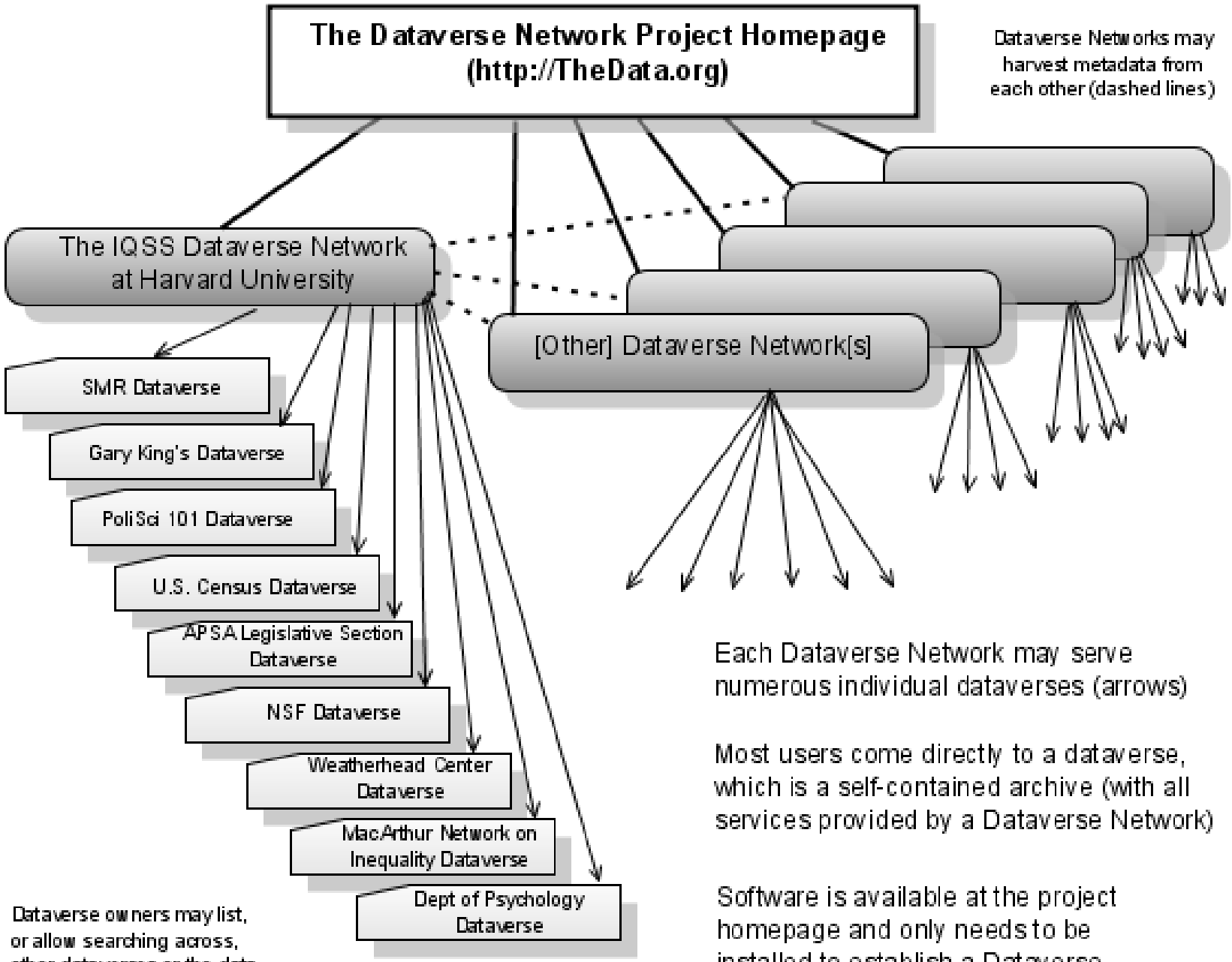
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(http://TheData.org)
Dataverse Networks may harvest metadata from each other (dashed lines)
The IQSS Dataverse Network at Harvard University
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SMR Dataverse
Gary King's Dataverse
PoliSci 101 Dataverse
U.S. Census Dataverse
APSA Legislative Section Dataverse
NSF Dataverse
Weatherhead Center Dataverse
MacArthur Network on Inequality Dataverse
Dept of Psychology Dataverse
Dataverse owners may list, or allow searching across, other dataverses or the data sets in them
Each Dataverse Network may serve numerous individual dataverses (arrows)
Most users come directly to a dataverse, which is a self-contained archive (with all services provided by a Dataverse Network)
Software is available at the project homepage and only needs to be installed to establish a Dataverse Network. Dataverses are virtual hosts.

Your Own Dataverse

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- Reuse: a data set may appear on different dataverses if desired

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- Replication policies cause journals to be cited three times as frequently! (with dataverse, it should be more)

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  - Send letters requesting data created under earlier grants

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- NSF (or an archive in their name) hosts the web application software
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  - New policy: data collections claimed on final reports must have citations

The Data Center When I Came to Harvard

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Give me my data!!!!

The Harvard-MIT Data Center Today

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- Dataverses and Dataverse Networks now being installed elsewhere

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- Result: Massive increase publicly available data

For more information

http://GKing.Harvard.edu

Cutting Edge Technology used in DVN Software

- Written in Java Enterprise Edition 5 (team picked for JavaOne)
- Enterprise JavaBeans 3.0 to manage software components
- JavaServer Faces for building the user interface
- Builds on other open source components:
  - GlassFish application server (wrote press release on our project)
  - R for statistical computing
  - Zelig simplifies R and encompasses many statistical methods
  - Apache Lucene for an index server and search engine
  - PostgreSQL as a database
  - Shale Tile and Tiles 2 for our user interface framework
  - Awstats for web statistics
  - OAI Cat and OAIHarvester2 for harvesting data and metatadata
  - The Handle System for persistent identifers