# Spatial Research of Health and Environment with China Data

**Shuming Bao**China Data Institute

## Paper One: Risk Assessment of Environmental Impact of Power Generation on Human Health

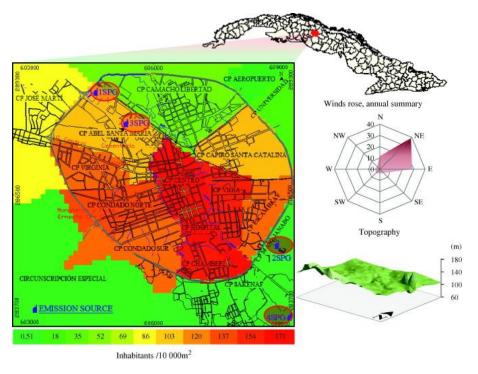


Figure. Representation of the population density distribution and location of emission sources in Santa Clara.

Environmental impact of decentralized power generation in Santa Clara City, Cuba: An integrated assessment based on technological and human health risk indicators, *Applied Energy*, Volume 109, 2013, 24–35 Herrera, J. De Ruyck, V.S. Ocaña, M. Rubio, R.M. Martínez, V. Núñez

## Paper Two: Spatial Accessibility to Health Care

- Two-step floating catchment area (FCA) method

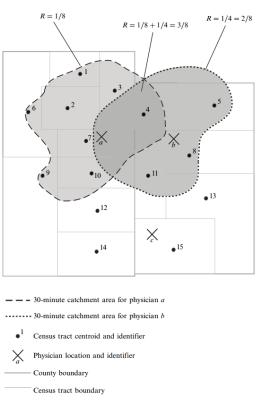
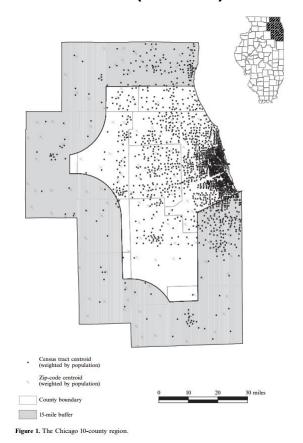


Figure 3. The two-step floating catchment area (FCA) method.

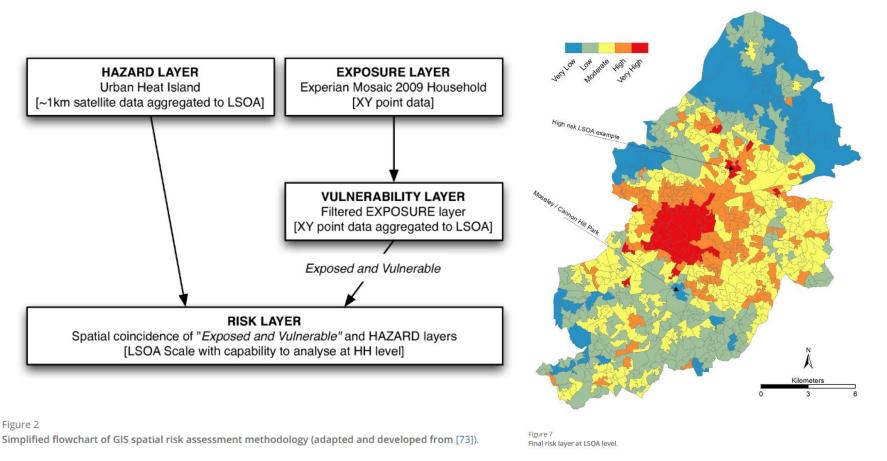


Measures of spatial accessibility to health care in a GIS environment: synthesis and a case study in the Chicago region. *Environment and Planning B: Planning and Design*, 2003

Wei Luo, Fahui Wang

http://epb.sagepub.com/content/30/6/865.short

## Paper Three: Spatial Health Risk Assessment



Including the urban heat island in spatial heat health risk assessment strategies: a case study for Birmingham, UK. International Journal of Health

Geographics2011**10**:42

Charlie Tomlinson, Lee Chapman, John Thornes and Christopher J Baker **DOI**: 10.1186/1476-072X-10-42

### **Factors & Questions for Spatial Study of Health**

#### **Primary factors:**

- Demand: consumers
- Supply: health facilities
- Sources of hazards

#### **Key questions:**

- Where are demands, supplies and hazards?
- What are the structures of demands, supplies and hazards?
- ☐ How those demands, supplies and hazards (spatial patterns and structures) have been changing over time and space?

## **Data: China**

#### Government Statistics

- o Provincial Statistics (1949 )
- o City Statistics (1996 )
- County Statistics (1997 )

#### Population Census

- Census 1953
- Census 1964
- Census 1982
- Census 1990
- Census 2000/2010 (province, city, county, township, GRID)

#### Economic Census

- Industrial Census 1995 (province, city, county, ZIP)
- Basic Unit Census 2001 (province, city, county, ZIP)
- Economic Census 2004/2008 (province, city, county, ZIP)
- Establishments (more than 7 millions companies and organizations)

#### Geography and Environment

- Land Use data (GRID)
- Night-Time data (GRID)

## **China Data Online**

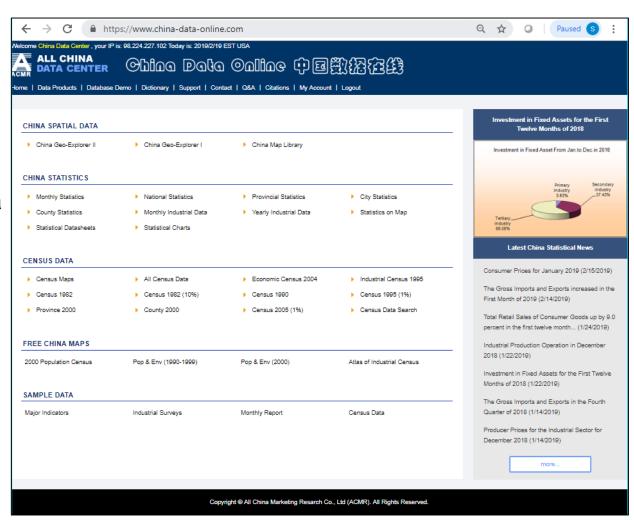
## http://china-data-online.com

#### **Gov't Statistics**

- National Statistics
- Provincial Statistics
- City Statistics
- County Statistics
- Monthly Industrial Data
- Yearly Industrial Data
- Statistical Datasheets

#### **Census Database**

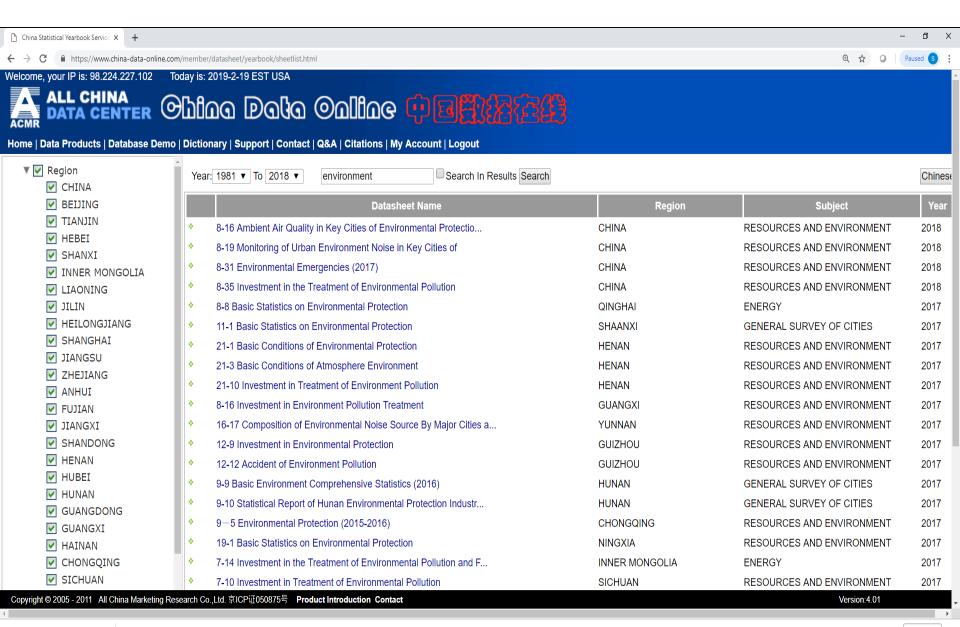
- Population Census
- Economic Census
- Industrial Census



## Statistical Datasheets: Health



## Statistical Datasheets: Environment



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Show all

## **Yearly Health Statistics**

- NUMBER OF HEALTH INSTITUIONS
  - Hospitals
  - Sanatoriums
  - Clinics
  - Specialized Prevention & treatment Centers & Stations
  - Sanitation and Anti-epidemic Institutions
  - Maternity and Child Care Centers
  - Medicines and Chemical Reagent Test Labs
  - Research Institutes of Medical Science
  - Other Institutions
- NUMBER OF PERSONS ENGAED IN HEALTH INSTITUTIONS
  - Doctors
    - Doctors of Traditional Chinese Medicine
    - Doctors of Western Medicine
    - Paramedics of Western Medicine
  - Senior and Junior Nurses
- NUMBER OF BEDS IN HEALTH INSTITUTIONS
  - Hospitals(10000 units)
  - Sanatoriums(10000 units)
  - Other Health Institutions(10000 units)

## Monthly and Yearly Industrial Statistics

- Medical and Pharmaceutical Products
- 27 Medical and Pharmaceutical Products
- 271 Chemical Medicine Materials
- 2710 Chemical Medicine Materials
- 272 Chemical Medicine Dose
- 2720 Chemical Medicine Dose
- 273\_ Traditional Chinese Medical Tablets Processing
- 2730 Traditional Chinese Medical Tablets Processing
- 274\_ Proprietary Chinese Medicines Production
- 2740 Proprietary Chinese Medicines Production
- 275\_ Animal Medicines
- 2750 Animal Medicines
- 276\_ Biopharmaceuticals Manufacturing
- 2760 Biopharmaceuticals Manufacturing
- 277\_ Sanitation Materials and Medical Articles
- 2770 Sanitation Materials and Medical Articles

## **Chemical Medicine Materials: General Analysis on Industry**

- Basic condition
- Assets and Debts
- Losses and Profits
- Economic Benefit Indicators

## **Imports & Exports of Main Commodities**

- Medicines
- Antibiotics(excluding preparation)

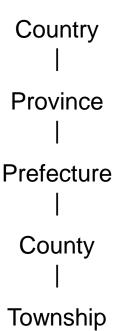
#### **Output of Main Products**

Chemical Medicine as Material

## **Population Census**

> 2,000 demographic variables in 2000 population Census > 50,000 towns and townships

#### **Geographical Levels:**



#### 2000 Census data variables:

- General Information
- Nationalities
- Age Structure
- Household Structure
- Education
- Fertility
- Deaths
- Marriage
- Migration
- Housing Status
- Industries and Occupations

## **Economic Census**

#### > Cover more than 7 million economic units

| In | d | us | tri  | es |
|----|---|----|------|----|
|    | u | uJ | CI I | CO |

- 852 industries

#### **Products**

- 3 primary products

#### **Ownerships**

- 23 different industries

#### Revenue

- 15 revenue ranges

#### **Employment**

- 10 employment ranges

#### **Employment**

1-19 20-49 50-99 100-499 500-999

1000-4999 5000-29999

30000-49999

50000+

#### Revenue

(in 10,000 Yuan)

0-30

30---50

50---100

100--300

300--500

500--1000

1000-3000

3000-5000

5000-10000

10000-30000

30000-50000

50000-100000

100000-150000

150000-200000

200000 and over

## Manufacture of Medical Machinery

### 经普数据: 医疗设备制造业

医疗诊断、监护及治疗设备制造 口腔科用设备及器具制造 实验室及医用消毒设备和器具的制 医疗、外科及兽医用器械制造 机械治疗及病房护理设备制造 假肢、人工器官及植(介)入器械 其他医疗设备及器械制造 Medical diagnosis, care and treatment equipment manufacturing

Dental equipment and apparatus used manufacturing

Laboratory and medical equipment and apparatus disinfection system

Medical, surgical and veterinary equipment manufacturing

Treatment and Nursing mechanical equipment manufacturing

artificial organs and plantations (referred) to enter Devices

Other medical equipment and device manufacturing

|   | Baoshan | Changning | Changshu | Chongming | Fengxian | Hongkou | Huangpu | Jiading | Jingan | Kunshan | Luwan | Minxing | Nanhui |
|---|---------|-----------|----------|-----------|----------|---------|---------|---------|--------|---------|-------|---------|--------|
| 2008 Daily and medical rubber products manufacturing                    | 4       | 2         | 5        | 0         | 3        | 2       | 0       | 14      | 0      | 4       | 0     | 4       | 4      |
| 2008 Medical diagnosis, care and treatment equipment manufacturing      | 8       | 0         | 2        | 4         | 9        | 5       | 0       | 12      | 2      | 4       | 2     | 8       | 10     |
| 2008 Dental equipment and apparatus used manufacturing                  | 1       | 0         | 1        | 2         | 3        | 1       | 0       | 1       | 0      | 2       | 0     | 4       | 4      |
| 2008 Laboratory and medical equipment and apparatus disinfection system | 6       | 1         | 1        | 1         | 3        | 1       | 0       | 2       | 0      | 2       | 0     | 3       | 2      |
| 2008 Medical, surgical and veterinary equipment manufacturing           | 10      | 2         | 6        | 0         | 6        | 3       | 2       | 13      | 0      | 8       | 0     | 8       | 12     |
| 2008 Treatment and Nursing mechanical equipment manufacturing           | 0       | 2         | 0        | 0         | 3        | 2       | 0       | 1       | 0      | 1       | 0     | 3       | 1      |
| 2008 artificial organs and plantations (referred) to enter Devices      | 3       | 5         | 1        | 0         | 2        | 4       | 0       | 0       | 7      | 0       | 1     | 8       | 2      |
| 2008 Other medical equipment and device manufacturing                   | 11      | 1         | 9        | 5         | 11       | 4       | 0       | 14      | 0      | 6       | 1     | 16      | 7      |

## **Manufacture of Medicines**

### 经普数据: 医药制造业

化学药品原药制造 The original drug manufacturing chemicals

化学药品制剂制造 Chemical agent production

中药饮片加工 Pieces of Traditional Chinese medicine processing

中成药制造 Traditional Chinese Prepared Medicines

兽用药品制造 Veterinary medicine manufacturing

生物、生化制品的制造 Biological, chemical and biological products manufacturing

卫生材料及医药用品制造 Sanitation Materials and Medical Articles

|   | Baoshan | Changning | Changshu | Chongming | Fengxian | Hongkou | Huangpu | Jiading | Jingan | Kunshan |
|---|---------|-----------|----------|-----------|----------|---------|---------|---------|--------|---------|
| 2008 The original drug manufacturing chemicals                  | 5       | 0         | 12       | 0         | 5        | 1       | 1       | 13      | 0      | 20      |
| 2008 Chemical agent production                                  | 5       | 2         | 2        | 1         | 11       | 0       | 0       | 14      | 0      | 9       |
| 2008 Pieces of Traditional Chinese medicine processing          | 1       | 0         | 0        | 1         | 1        | 1       | 1       | 4       | 0      | 0       |
| 2008 Traditional Chinese Prepared Medicines                     | 2       | 0         | 2        | 2         | 3        | 0       | 1       | 5       | 1      | 0       |
| 2008 Veterinary medicine manufacturing                          | 4       | 0         | 1        | 0         | 3        | 0       | 0       | 4       | 0      | 0       |
| 2008 Biological, chemical and biological products manufacturing | 9       | 1         | 2        | 0         | 17       | 1       | 1       | 3       | 0      | 9       |
| 2008 Sanitation Materials and Medical Articles                  | 15      | 2         | 6        | 4         | 12       | 0       | 0       | 5       | 1      | 13      |

### **Health Care**

### 经普数据: 医疗服务业

综合医院 中医医院

中西医结合医院

民族医院

专科医院

疗养院

卫生院及社区医疗活动

门诊部医疗活动

计划生育技术服务活动

妇幼保健活动

专科疾病防治活动

疾病预防控制及防疫活动

其他卫生活动

社会保障业

干部休养所

收养收容服务

不提供住宿的社会福利

**General Hospital** 

Traditional Chinese medicine hospital

Combined Traditional Chinese and Western Medicine Hospital

**National Minority Hospital** 

**Specialist Hospital** 

**Nursing Homes** 

Health Centers and Community Medical Treatment Activities

Clinics Medical Treatment Activities

Family planning service

Maternal and child health service

Specialist service for Disease Control and Prevention

Vaccination for disease prevention and control service

Other health services

Social Security

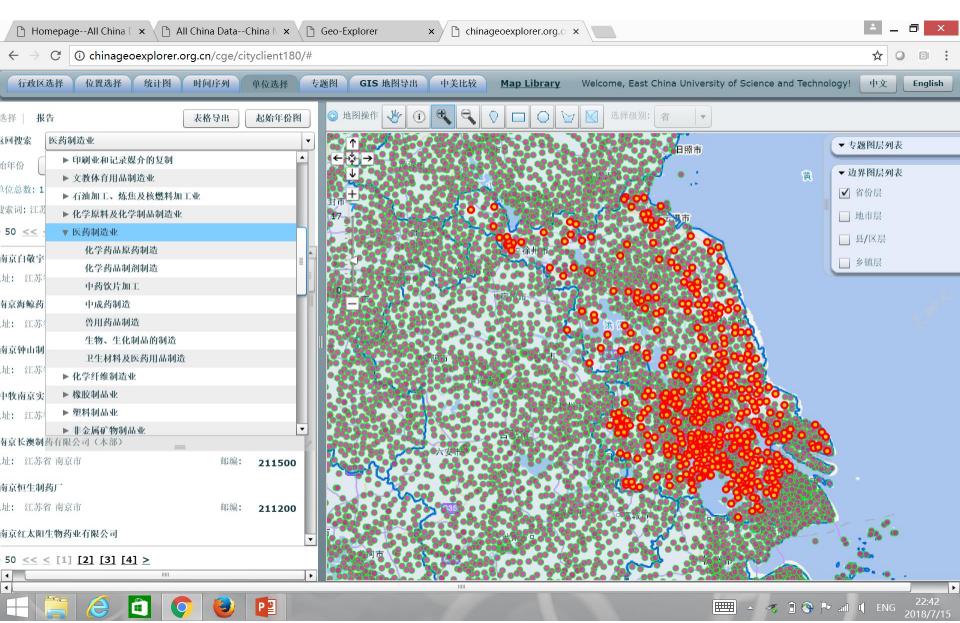
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Adoption of asylum ser

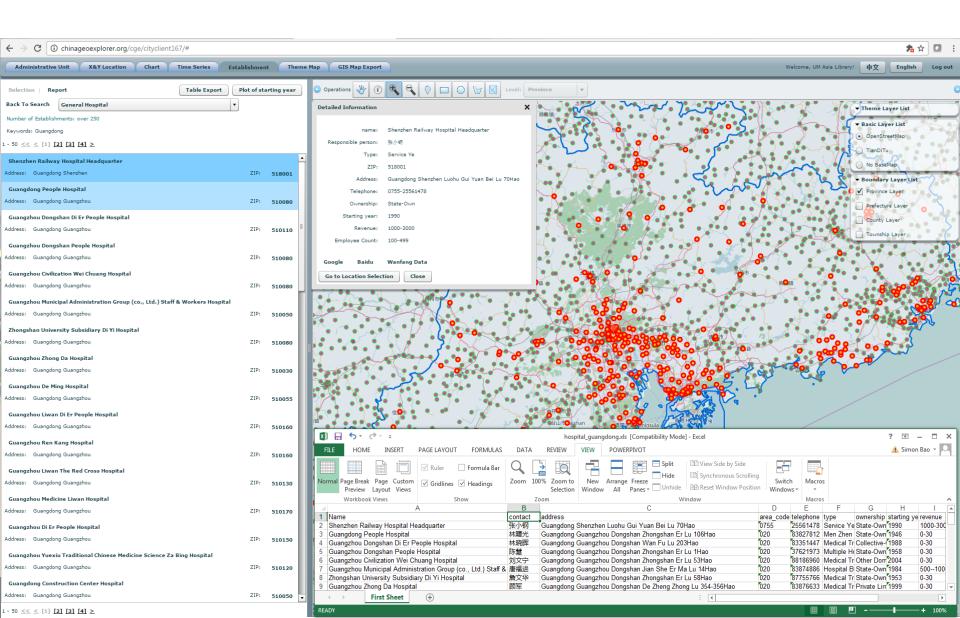
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| Date:                               | 14/10/2016                           |                        |                           |                       |
|-------------------------------------|--------------------------------------|------------------------|---------------------------|-----------------------|
| Selection:                          | (24 selected) Baoshan , Changni      | ng , Changshu , Chongn | ning , Fengxian , Hongkou | ı , Huangpu , Jiading |
|                                     |                                      | Baoshan                | Changning                 | Changshu              |
| 2008 General Ho                     | ospital                              | 14                     | 12                        | 8                     |
| 2008 Traditional                    | Chinese medicine hospital            | 1                      | 2                         | 1                     |
| 2008 Combined<br>Medicine Hospita   | Traditional Chinese and Western<br>I | 0                      | 1                         | 0                     |
| 2008 National M                     | linority Hospital                    | 0                      | 0                         | 0                     |
| 2008 Specialist I                   | Hospital                             | 5                      | 17                        | 11                    |
| 2008 Nursing Ho                     | omes                                 | 2                      | 5                         | 1                     |
| 2008 Health Cer<br>Treatment Activi | nters and Community Medical<br>ities | 18                     | 7                         | 27                    |
| 2008 Clinics Med                    | dical Treatment Activities           | 22                     | 31                        | 22                    |
| 2008 Family plan                    | nning service                        | 2                      | 3                         | 8                     |
| 2008 Maternal a                     | nd child health service              | 2                      | 2                         | 1                     |
| 2008 Specialist s<br>Prevention     | service for Disease Control and      | 3                      | 3                         | 0                     |
| 2008 Vaccination<br>service         | n for disease prevention and control | 1                      | 6                         | 4                     |
| 2008 Other heal                     | Ith services                         | 6                      | 5                         | 10                    |

## **Pharmacy Manufacturing**



## **Spatial Distribution of Hospitals**



# Challenges for Spatial Study of Health & Environment

- ➤ How to integrate large data sets from different sources?
- ➤ How to integrate spatial data and non-spatial data?
- How to integrate the data with methodology?

## All China Marketing Research

## Integrating statistics and GIS into powerful tools for analysis of data

### China Geo-Explorer II

China Geo-Explorer (CGE) fully integrates different data sources from government statistics, population census and economics census of China at different levels (province, city, county, township and ZIP code) into a spatial system with more than 6,000 comparable variables for easy access.

Free Version User Guide Citations

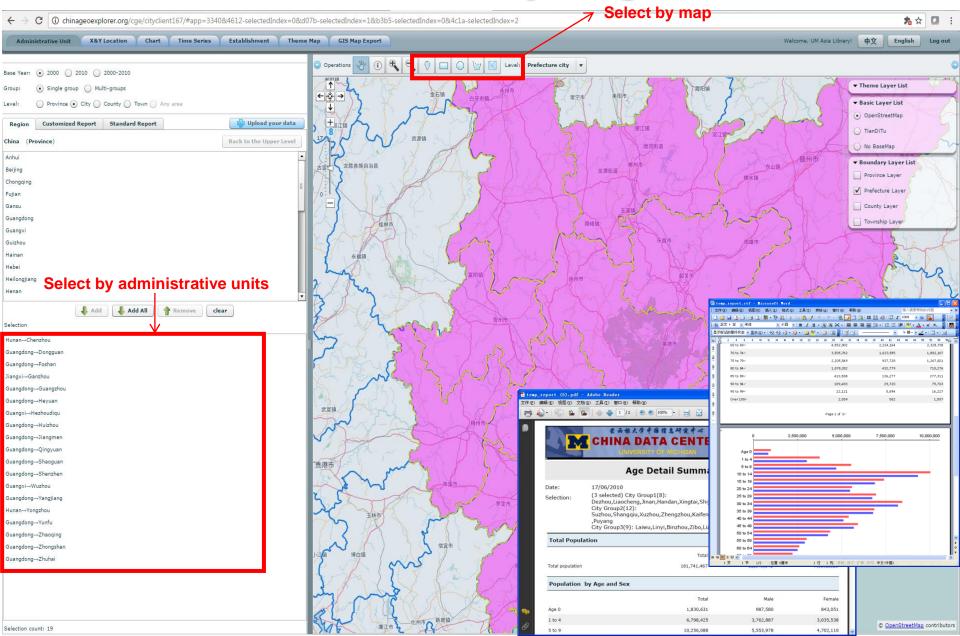
### **→ US Geo-Explorer**

US Geo-Explorer (UGE) fully integrates the population census and business data of the U.S. from different years at different levels (state, metropolitan, county, CCD, place, tract and block) into a spatial system with more than 40,000 comparable variables for easy access.

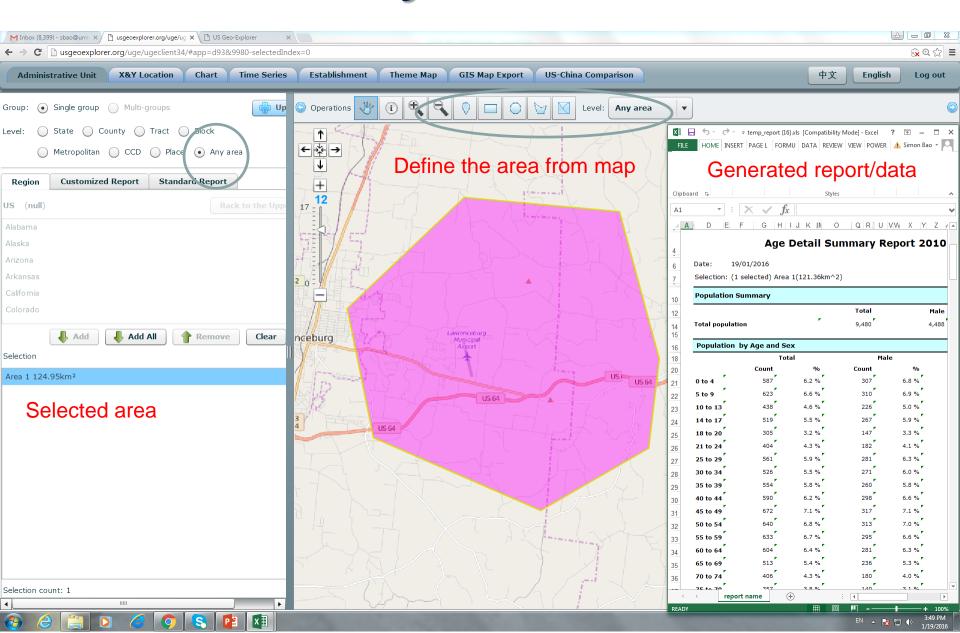
User's Guide

<sup>\*</sup>Both systems are compatible with IE 8+, FireFox or Chrome. Flash player 9 or higher version is required.

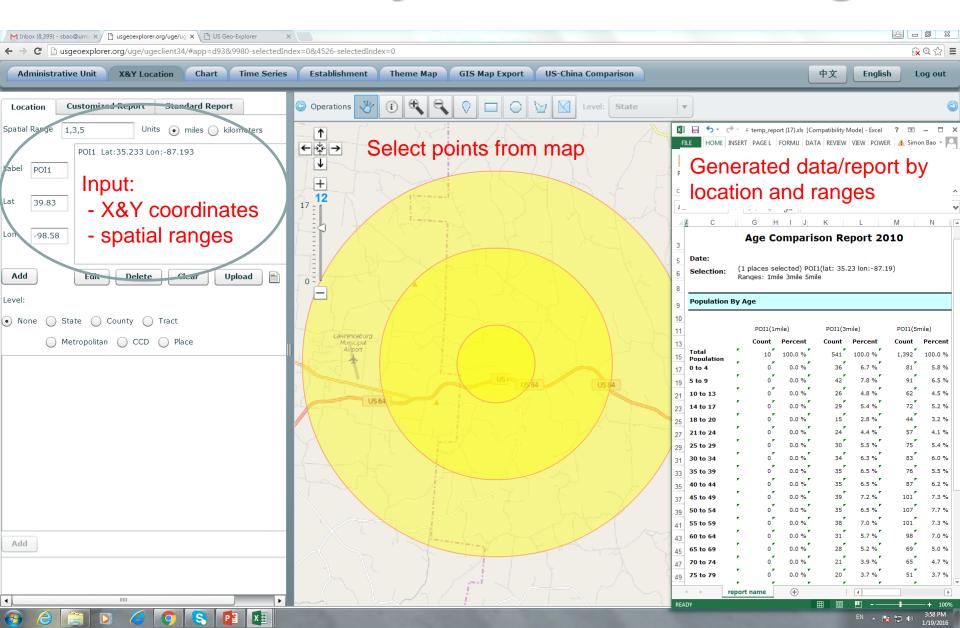
## **Select Data by Region**



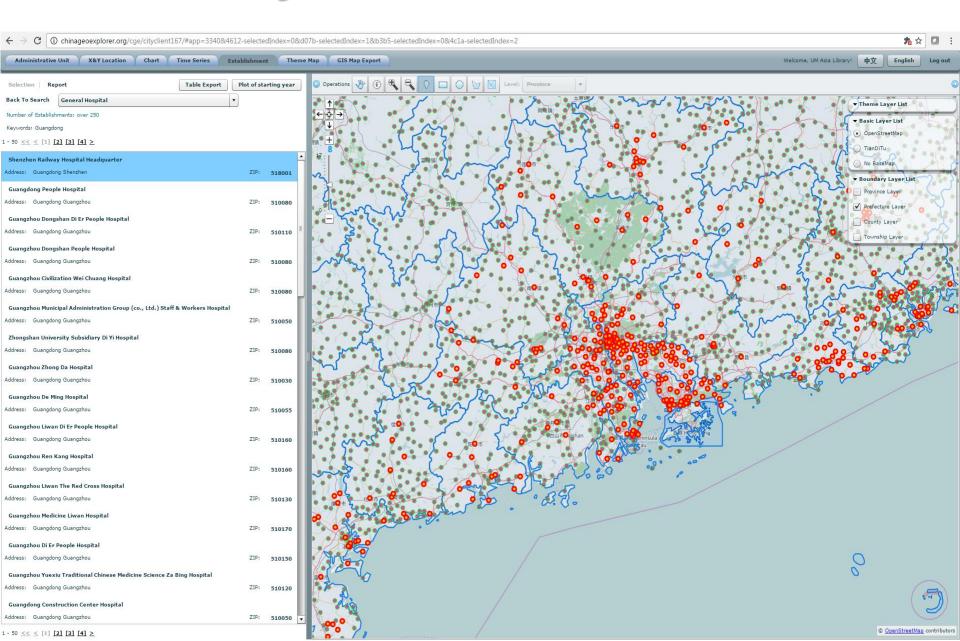
## Select Data by Self-defined Areas



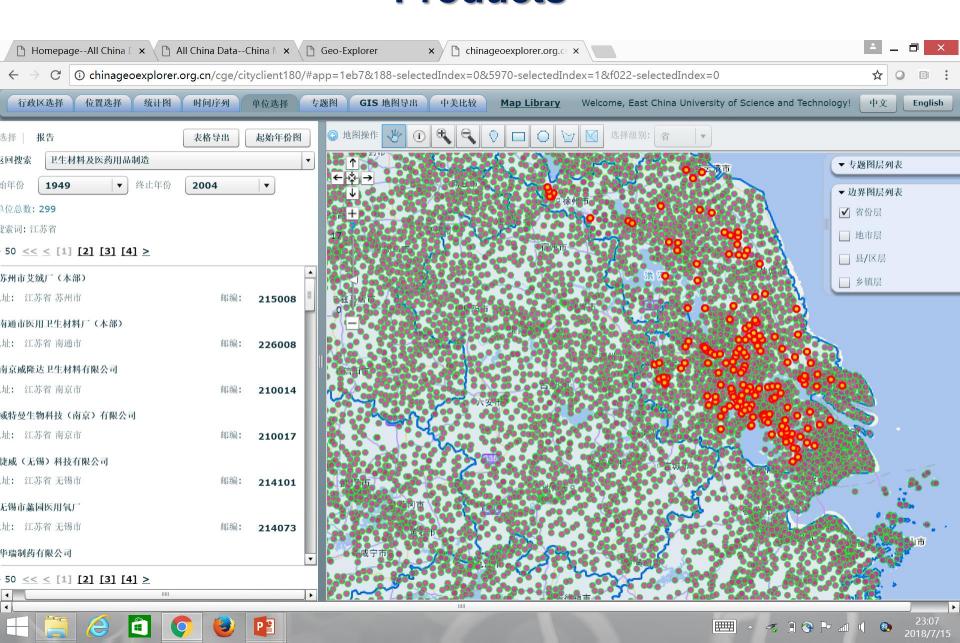
## **Select Data by Location & Ranges**



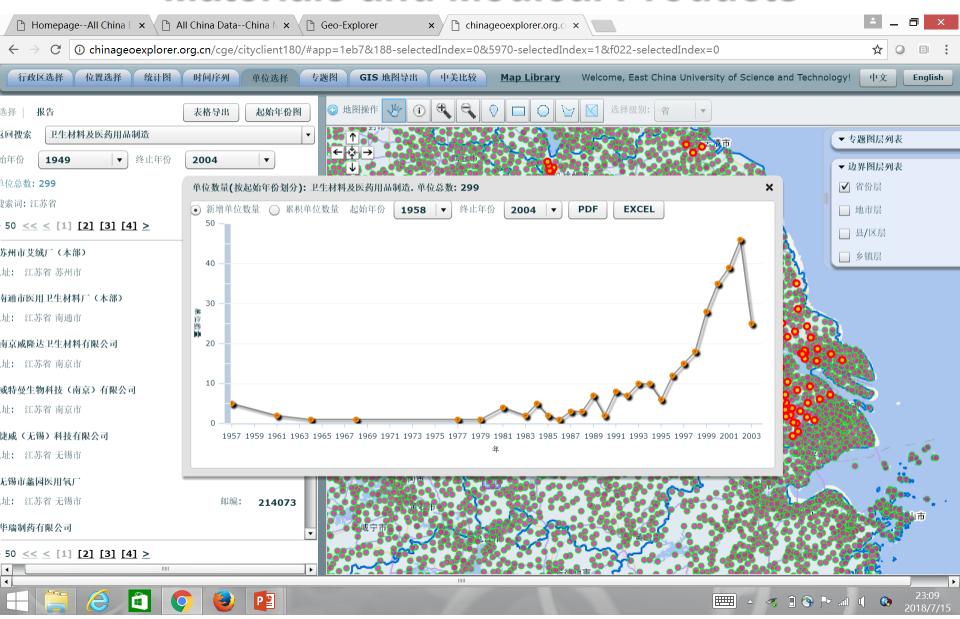
## Selection by Health or Hazards Facilities



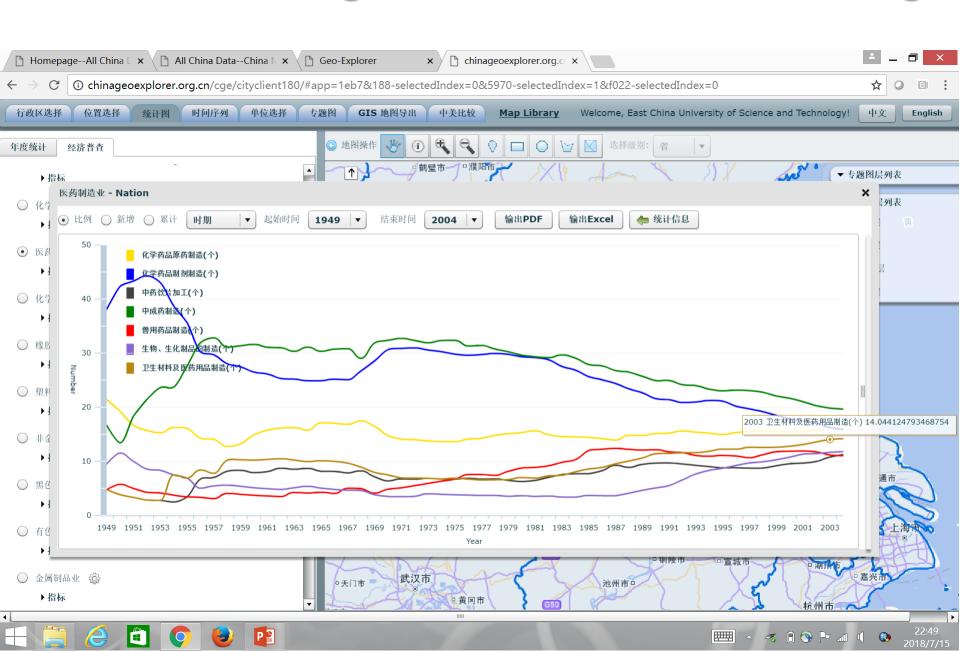
## Manufactures of Health Materials and Medical Products



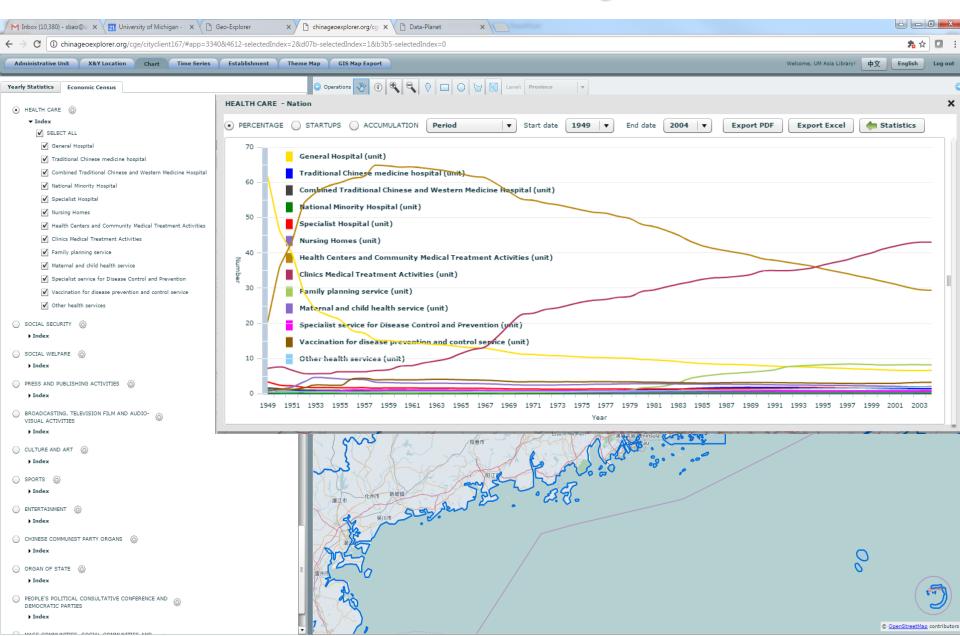
## New Start Ups of Manufactures of Health Materials and Medical Products



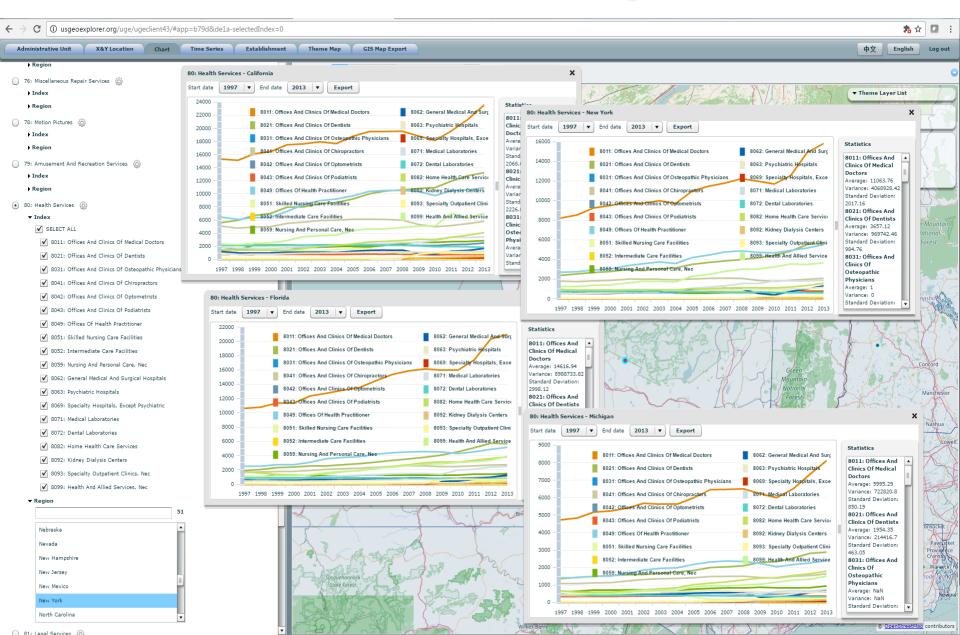
## Structural Changes in Medicine Manufacturing



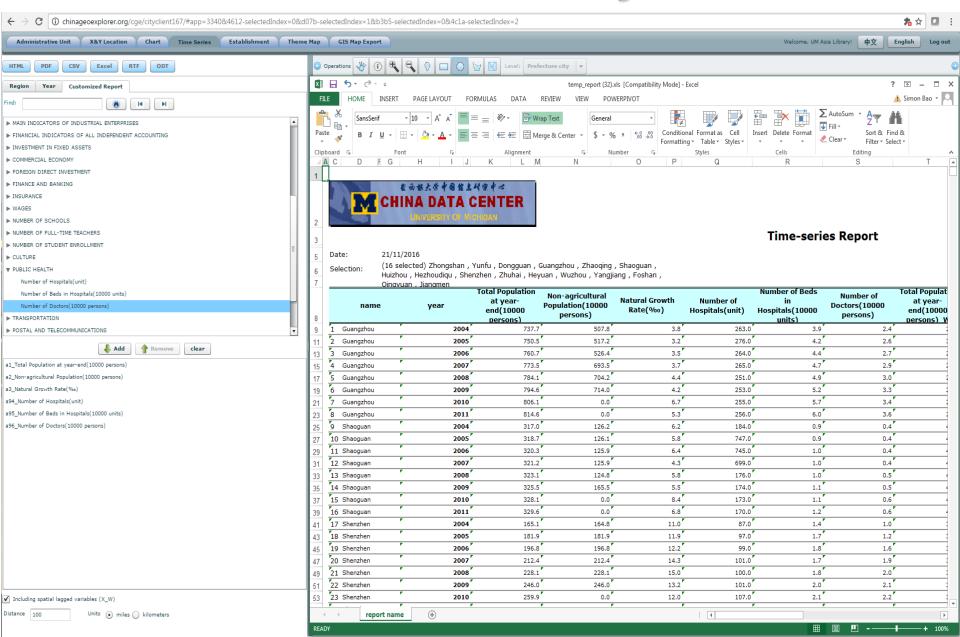
## **Health Structure Analysis: China**



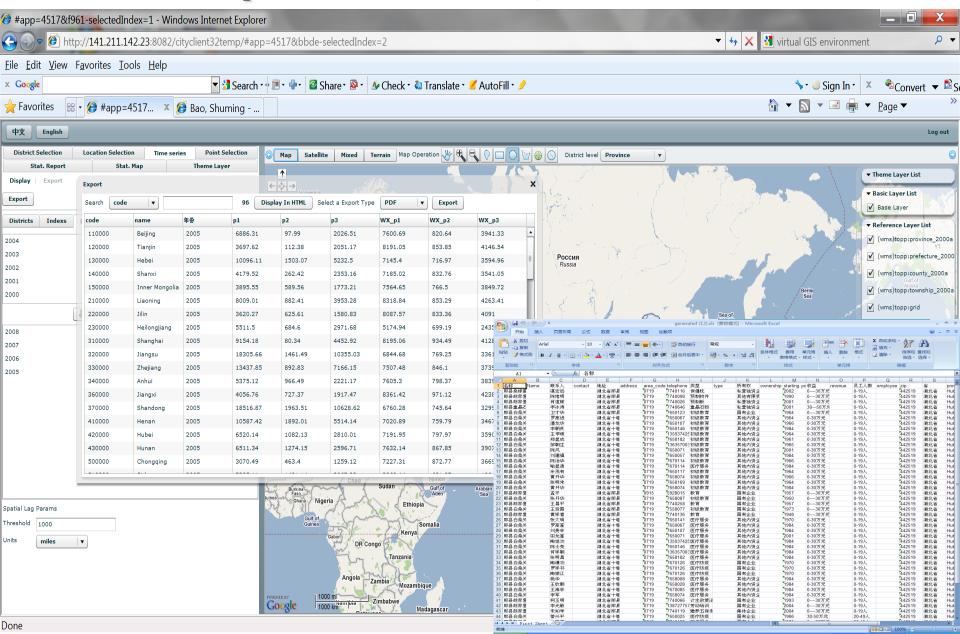
## **Heath Structure Analysis: US**



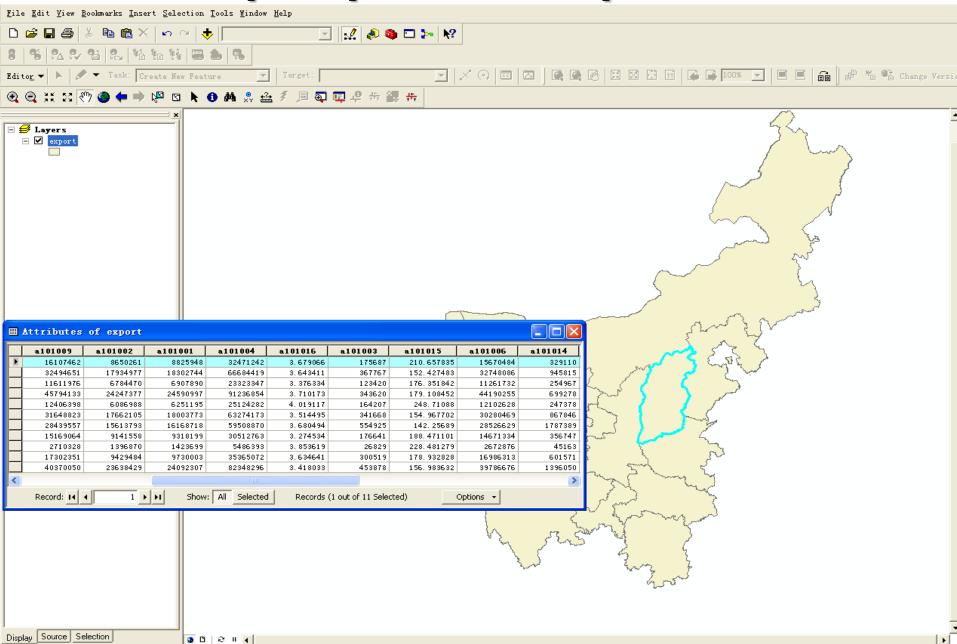
## **Panel Data Analysis**



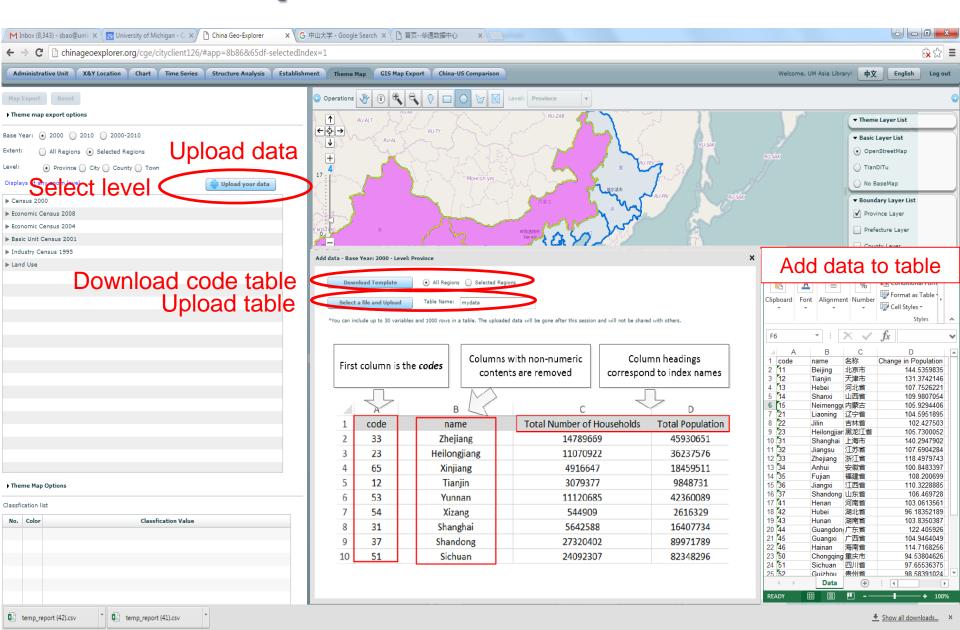
## Data Export to Excel, HTM and Word



## **Map Export to Shape Files**



## **Upload User's Data**



## An Integration of Data, Tools and Data Case Studies Based on the Cloud Platform

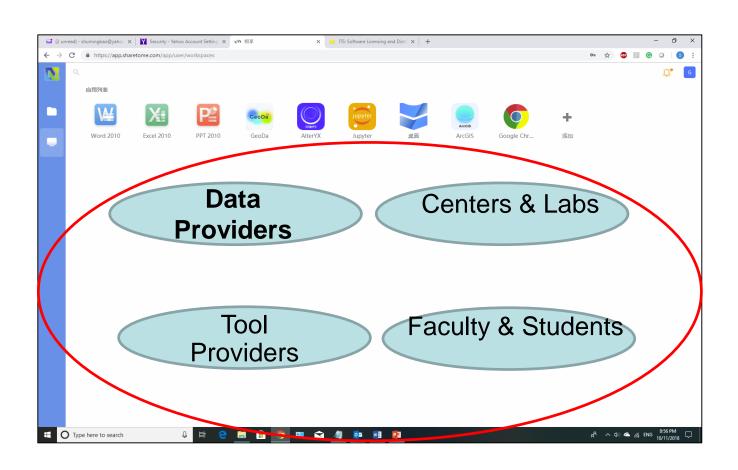
## China Data Lab

#### **Features:**

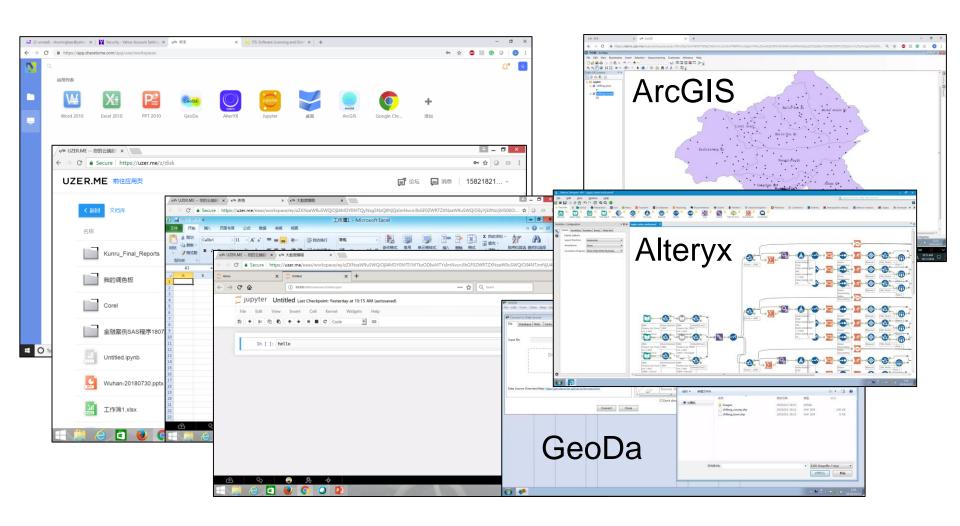
- Users can have access to the full source data on the cloud
- Users can use those powerful tools for data processing and analysis on the cloud without downloading the data
- Users can learn from the workflow based data case studies
- Users can download the analytical results and reports
- Users can replicate, reproduce and expand those case studies on the cloud

chinadatacenter.net / china-data-online.com

#### A Partner Network for China and Global Studies



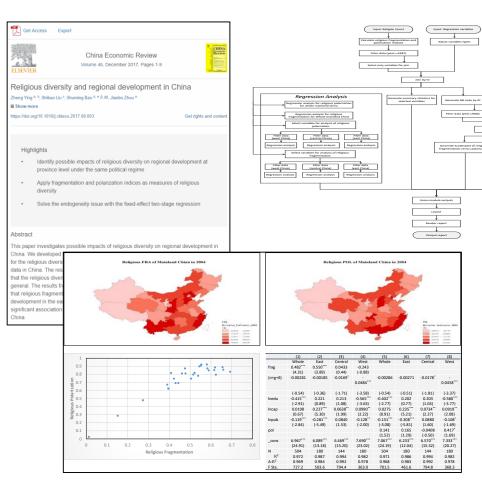
## **Cloud Based Data Analysis**



## **Workflow Based Data Case Study**

- □ Cultivate professional data analysis
- ☐ Improve the efficiency of data analysis
- □ Promote knowledge and information sharing
- □ Promote research collaborations
- □ Promote data applications in research and education

## The Workflow Based Data Case Study



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| Documents               | Description   | File                      |  |  |  |
|-------------------------|---|---------------------------|--|--|--|
| Case study report       | Word or PDF file                                    | Religion_study.docx       |  |  |  |
| Case study presentation | Presentation file                                   | Religion_case.pptx        |  |  |  |
| Data                    | Religious data table in Excel                       | Data_religion.xlsx        |  |  |  |
|                         | Statistical table in Excel                          | Data_statistics.xslx      |  |  |  |
|                         | Province map in Shape file                          | Province_boundary.shp     |  |  |  |
| Alteryx module          | Alteryx workflow                                    | Religion_case.yxmd        |  |  |  |
| Technical report        | Description of Alteryx workflow                     | Tech_report_religion.docx |  |  |  |
| Technical output        | Output file generated by<br>Alteryx workflow module | Output_religion.pdf       |  |  |  |

## **Online Tools: China Data Online** http://china-data-online.com **China Data Institute** http://chinadatacenter.net **China Data Lab** http://chinadatalab.cn

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