

**Course Information:**

Time: Thursday, 4:15-6:15 PM  
Location: CUNY Grad Center, 6-418

**Contact Information:**

Professor: Deborah Balk  
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**General Description:**

This 3-credit course provides an overview of spatial themes and techniques in demography. Examples will be drawn from many substantive areas of demography (e.g., mortality, fertility, urbanization, migration, poverty). Students will learn about spatial construction of place, basic mapping skills and spatial data creation and geoprocessing as well as statistical methods to explore and model spatially-referenced data to answer demographic questions. In the most advanced topics, students examine the special difficulties that spatial data may create for standard regression approaches, and learn models and approaches for undertaking multivariate regression analysis in the presence of spatial heterogeneity and/or spatial dependence. Emphasis in the course is evenly split between learning how to make maps and a variety of spatial analyses.

*Pre-requisite:* DCP 70100; and introductory statistics including multiple linear regression, or permission of instructor.

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**Learning Goals**

By the end of the course, students will be able to:

1. Think critically about spatial constructs in answering demographic questions.
  2. Create thematic maps with mapping software.
    - a. Apply basic geographic conventions for map-making in displaying quantitative and qualitative information, understand and modify maps projections, and understand different methods of data representation and classification.
    - b. Present and format maps having learned the following (but not only) skills: creating dual layout views and call outs, use of map elements (legends, labels, scale bars, and north arrows), and use of tables and graphics with maps.
  3. Construct spatial information rigorously by importing, cleaning, and editing data in mapping software and the construction of new data or variables that result from basic geoprocessing operations (e.g., distance or buffer calculations).
  4. Interpret and analyze maps critically, by reviewing uses of maps in demographic applications.
  5. Interpret and analyze spatial data and methods critically.
  6. Identify the need for and use a variety of common spatial analytic methods in demography.
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## Course Requirements

The requirements are comprised of two kinds: Homework assignments (including a final larger assignment) and exams.

### Assignments

- There will be a homework assignment after most sessions, intended as a means of reinforcing the material taught in that session. Assignments are due at the start of each class. Assignments not turned in by that time will receive zero credit. Each assignment is worth 15 points and will have equal weight. I will automatically drop the assignment with the lowest mark. These homework assignments will account for 65% of your grade.
- In lieu of a final exam, you will have a final assignment, worth 15% of your grade.

### Exams

- There will be two in-class exams, each short (an hour at most). Each exam count will count for 1/10<sup>th</sup> of your grade. (Together these exams count for 20%.)

### Attendance

- **Missed classes:** We will build on concepts from week-to-week. With the exception of documented emergencies or illness, more than three missed classes per semester will result in an automatic F grade. If you miss two or fewer classes, you are still responsible for learning the material (on your own) and turning in the assignment on time.
- Please bring the Clemmer **text book** to every class (or at least until I indicate otherwise).

### Grading

Your grade is made up of these parts:

Weekly homework assignments:	65%
Two short in-class exams:	20%
Final assignment*:	15%

\* I reserve the right to change this to an exam, mid-course. But it is my plan to make this a final assignment.

The grading for this course is as follows:

A	90-100
B	80-89
C	70-79
F	69 or lower

Digits ending in 0-2.4 receive a (-), and those ending in 7.4-9.9 receive a (+).

I strongly encourage class participation. It benefits you, your classmates, and me.

Note that there is no use of cell phones—except for emergency receipt of calls—during class. No txtng. No exceptions. I promise you that txtng makes me very grumpy. You will be using the computer during the lab part of the class: Please limit your use of it to class-specific activities.

**Other things you'll want to know:**

- You must use the class Blackboard site so that you can receive course readings, updates and obtain lecture notes and other handouts. I will send email to the class via Blackboard.
  - Please forward your CUNY e-mail to your most frequently checked e-mail address. Check your e-mail regularly so that you can receive communications and periodic updates about the class.
  - You are expected to complete readings and written assignments prior to class.
  - The instructors are available by appointment to assist students with assignments and course material. It will help if you indicate DCP 803 in the subject line.
  - Students may *not* record class without instructor's permission.
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**Academic Integrity:**

By participating in this course you fully support CUNY's policy on Academic Honesty. Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the college's educational mission and the students' personal and intellectual growth. Students are expected to bear individual responsibility for their work, to learn the rules and definitions that underlie the practice of academic integrity, and to uphold its ideals. Ignorance of the rules is not an acceptable excuse for disobeying them. Any student who attempts to compromise or devalue the academic process will be sanctioned. Academic sanctions in this class will range from a failing grade on the assignment to a failing grade for the entire course. The CUNY Policy on Academic Integrity is available at: [http://www.kbcc.cuny.edu/Academic\\_Integrity\\_Policy.pdf](http://www.kbcc.cuny.edu/Academic_Integrity_Policy.pdf).

**Students with Disability:**

CUNY provides reasonable accommodations and modifications for students with disabilities. We strive to ensure that no student with a disability is discriminated against and that none is denied participation in programs and activities for lack of auxiliary aids or other accommodations. Examples of accommodations include more time for examinations for students with learning disabilities or illnesses that reduce stamina, or for students who take medication that reduces processing speed, adaptive equipment for students with a variety of disabilities, and taping of classes. It is best to speak with me as soon as possible so that you will have full access as quickly as possible. We are available to discuss these matters confidentially. Students who wish to request accommodations or have questions about Graduate Center facilities, auxiliary aids and services, or any Graduate Center academic matters are encouraged to contact the Office of Student Affairs (Ms. Sharon Lerner, Director of Student Affairs; Miss Elise M. Perram, Associate Director of Student Affairs; or the Vice President for Student Affairs, Mr. Matthew G. Schoengood, who is also the coordinator for persons with disabilities (Room 7301; Telephone: 1-212-817-7400)). Discussions and information regarding a student's disability will be kept confidential unless a student requests otherwise. Appropriate documentation to obtain accommodations is required to be provided to the Student Affairs office.

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**Course text and required materials:****Required Textbooks:**

1. Clemmer Gina (2010), *The GIS 20 Essential Skills*, Redlands: ESRI Press.
2. Lloyd, Christopher D. (2010) *Spatial Data Analysis*. New York: Oxford University Press.

**Other:**

1. ArcGIS Version 10, available on campus and student version that I will supply. (See notes.)
2. A memory stick/jump drive (minimum 1 GB capacity recommended) that you will supply.

Copies of the text books are available at the GC library. **Required chapters** in other books and journal **articles** will be available on the class blackboard site. A list of these papers follows.

**Readings (list as of 13 September):**

1. **Balk**, D., T. Pullum, A. Storeygard, F. Grenwell and M. Neuman. (2004) A Spatial Analysis of Childhood Mortality in West Africa, *Population. Space and Place* **10**, 175–216.
2. **Chin**, Brian, Livia Montana, and Xavier Basagaña (2011). "Spatial modeling of geographic inequalities in child mortality across Nepal." *Health & Place* 17, no. 4: 929-936.
3. **Chakraborty**, Jayajit and Marc **Armstrong**, (2004). "Thinking Outside the Circle: Using Geographical Knowledge to Focus Environmental Risk Assessment Investigations" in Janelle, D., B. Warf and K. Hansen, *WorldMinds: Geographical Perspectives on 100 Problems*. Boston: Kluwer Academic Publishers.
4. **Donnelly**, Frank (2012). "The American Factfinder: A Brief Demonstration" handout dated July 25, 2012.
5. **Duncan**, Greg J. (2008). "When to Promote, and When to Avoid, a Population Perspective" *Demography*, 45: 4, November (2008), pp. 763-784.
6. **Entwisle**. B. (2007). "Putting People into Place," *Demography* 44(4): 687-703.
7. **Lam**, David (2011). "How the World Survived the Population Bomb: Lessons From 50 Years of Extraordinary Demographic History," *Demography* 48:1231–1262.
8. **Haylett**, Michele and Lynda **Kellam** (2010). "The American Community Survey: Benefits and Challenges," IASSIST Quarterly Winter/Spring 2010.
9. **Matthews**, Stephen and Tse-Chuan **Yang** (2012), "Mapping the results of local statistics: Using Geographically Weighted Regression," 26 (6): 151-166 <http://www.demographic-research.org/Volumes/Vol26/6/> DOI: 10.4054/DemRes.2012.26.6
10. **McFalls**, Joseph A. Jr (2007). "Population: A Lively Introduction" 5th Edition, *Population Bulletin* 62:1.
11. **McGranahan**, G., D. Balk and B. Anderson (2007). "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones." *Environment and Urbanization* 19(1): 17-37.
12. **McLafferty** S. and S. **Grady** (2005). Immigration and Geographical Access to Prenatal Clinics in Brooklyn, NY: A Geographic Information Systems Analysis," *American Journal of Public Health*, 95(4), 638-640.
13. **Montgomery**, M. R. (2008). "The Urban Transformation of the Developing World," *Science* 319: 761-4.
14. **Moore**, L. and A. **Diez Rouz** (2006), Associations of Neighborhood Characteristics with the Location and Type of Food Stores, *American Journal of Public Health* 96(2): 325-331.
15. **National Research Council** (2003). *Cities Transformed: Demographic Change and Its Implications in the Developing World*. Panel on Urban Population Dynamics, Mark Montgomery et al. (eds), Washington, DC: National Academies Press.
16. **Rosero-Bixby**, L. (2004). "Spatial access to health care in Costa Rica and its equity: a GIS-based study." *Social Science & Medicine* 58(7): 1271-1284.
17. **Schlossberg** M. A. (2004). "GIS, the US Census, and Neighbourhood Scale Analysis" *Planning Practice & Research*; 18 (2-3), 213-218.
18. **Scott**, Lauren M. and Mark V. **Janikas** (2010). "Spatial Statistics in ArcGIS," in *Handbook of Applied Spatial Statistics: Software, Tools, Methods and Applications*, Fischer and Getis (eds). NY: Springer.
19. **South**, Scott and Kyle **Crowder** (2010). Neighborhood Poverty and Nonmarital Fertility: Spatial and Temporal Dimensions" *Journal of Marriage and the Family* 72(Feb): 89-104.

20. **Tolnay**, Stewart E., Glenn Deane, and E. M. Beck. (1996). Vicarious Violence: Spatial Effects on Southern Lynchings, 1890-1919. *American Journal of Sociology* 102 (3): 788-815.
21. **Voss**, Paul R. (2007). "Demography as a Spatial Social Science," *Population Research & Policy Review* 26:457-476.
22. **Voss**, P. D. Long , R. Hammer , and S. Friedman, (2006), "Samantha County child poverty rates in the US: a spatial regression approach," *Population Research and Policy Review*, 25(4): 369-391.
23. **Yang**, Tse-Chuan and **Stephen** Matthews (2012), "Understanding the non-stationary associations between distrust of the health care system, health conditions, and self-rated health in the elderly: A geographically weighted regression approach," *Health & Place* 18 576-585.

**Additional book chapters:**

1. Kimerling, A. Jon et al., 2008. *Map Use: Reading, Analysis, Interpretation* Redlands, CA: ESRI Press.
  - a. Chapter 3: Map Projections
  - b. Chapter 8: Quantitative Thematic Maps
  - c. Chapter 21: Interpreting the Human Landscape
2. Maantay, J. and J. Zeigler 2006 *GIS for the Urban Environment*, CA: ESRI Press.
  - a. Chapter 9: Methods of Spatial Data Analysis

## Week-by-week (subject to change)

### Part I. Basic Map Making.

#### Class 1: August 30. Introduction

*Topics:*

Geography and GIS and their role of spatial thinking in demography.  
Geographic data types and structures; ArcGIS formats  
Getting started in ArcGIS: basic functions (opening & saving files, panning, zooming, identifying, basic symbology)  
Basic file management

*Readings:*

1. Glemmer, introduction (pp. viii – xiii)
2. Lloyd Chapters 1-2 (skim)
3. Voss (2007)
4. New York Times, “Then as now – New York’s shifting ethnic mosaic” Jan 22, 2011. (<http://www.nytimes.com/interactive/2011/01/23/nyregion/20110123-nyc-ethnic-neighborhoods-map.html>)

*For students who have not taken DCP 70100 (or its equivalent), also read:*

1. McFalls (2007)
2. Lam (2011)
3. Duncan (2008)

#### Class 2: September 6. Making Basic Maps

*Topics:*

What do you look for in a map? (What is place?)  
Symbology  
Legends  
Other essential elements for interpretation (scale, N arrows, titles, notes)  
Conventions for map display  
Displaying multiple things with a single layer  
Printing, exporting and saving maps

*Readings:*

1. Clemmer, Chapters 1-2
2. Entwisle (2007)

Assignment #1 due.

#### Class 3: September 13. Getting ‘under the hood’ of GIS; spatial Gaps in Demographic Inquiry

*Topics:*

Coordinate systems  
Projections  
Measuring distances  
Preparing and conditioning data tables for linking it with spatial data

Table joins

Reflections on why currently collected demographic data leave big gaps in understanding spatial equality, etc.

*Readings:*

1. Clemmer. Chapters 3-5
2. Kimerling et al., Chapter 3
3. Montgomery (2008)
4. NRC (2003)

Assignment #2 due.

#### **Class 4: September 20.** Thematic Mapping I

*Topics:*

What type of map for what type of analysis?

What do you want your map to say?

Different types of choropleth maps

Choice of cut-off points (natural breaks, n-tiles, manual)

Graduated color vs. graduate symbols

Dot density maps

Exclusions

Exporting the table

*Readings:*

1. Clemmer, Chapters 6 & 9
2. Kimerling et al, Chapter 8
3. Review articles for discussion (Montgomery, NRC, Voss, Entwisle)

Assignment #3 due.

#### **Class 5: September 27.** Mapping the Census

History of the census

Census geographies

Decennial census vs. American Community Survey

Mechanics of preparing data for spatial data integration

*Readings:*

1. Haylett and Kellam (2010)
2. Donnelly handout (2012)
3. Schlossberg (2004)

Assignment #4 due.

#### **Class 6: October 4.** Thematic Mapping II

*Topics:*

More about "Attribute" Tables

Table queries

Using the “selection” tool  
Continued discussion of thematic maps in demographic applications  
Discussion of boundaries (Review readings by: Montgomery, Schlossberg, and Gregory)  
Adding graphics to mapping units

*Readings:*

1. Kimerling et al, Chapter 21
2. Gregory (2000)

Assignment #5 due.

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## **Part II. Georeferencing and Geoprocessing**

**Class 7: October 11.** Georeferencing and mapping points (survey clusters, clinics, etc)

**Short exam (45 minutes)**

*Topics:*

Creating point data from a xy data  
Geocoding street addresses (in the US) [very brief]  
Pushing the limits of sampling frames  
The case for point data: calculating distances, contextual variables

*Readings:*

1. Clemmer. Chapters 8 & 10
2. Moore & Diez-Rouz (2006)
3. Balk et al (2004)

No homework assignment due.

**Class 8: October 18.** Geoprocessing essentials

*Topics:*

Merge, Dissolve, Clip, Unions, Intersections

*Readings:*

1. Lloyd, Chapter 5
2. Maantay and Zeigler, Chapter 9
3. Clemmer, Chapter 11

Assignment #6 due.

**Class 9: October 25.** Geospatial calculations continued & Constructing new data from overlays.

*Topics:*

Spatial joins  
Sophisticated querying and geoprocessing from multiple layers  
Creating new variables carefully  
Constructing centroids

Calculating distances, point to point.

Other calculations of distances

Buffers

Application: access to services, unmet need and other demographic uses

*Readings:*

1. Clemmer. Chapter 12, 15 & 6
2. Lloyd, Chapter 4
3. Rosero-Bixby (2004)
4. Chakraborty and Armstrong (2004)

Assignment #7 due.

**Class 10: November 1: HURRICANE SANDY -- CAMPUS CLOSED**

**Class 10: November 8:** Using spatial methods as an indirect estimation techniques

*Topics:*

(Topics from last week continued)

Smoothing across census units

From points or polygons to surfaces (or grids) in demography

“Cost” surfaces?

*Readings:*

1. (Good idea to review previously assigned chapters in Lloyd)
2. Storeygard et al. (2008)
3. Chin et al. (2011)

Assignment #8 due.

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### **Part III. Advanced Topics.**

**Class 11: November 15.** Exploring spatial point patterns

**Short Exam.**

*Topics:*

Kernel estimation

Nearest-neighbor and K functions (spatial clustering)

*Readings:*

1. Lloyd, Chapter 7
2. McLafferty and Grady (2004)

No assignment due.

No Class. **November 22.** Happy Thanksgiving.

**Class 12: November 29.** Spatial Autocorrelation

*Topics:*  
Local spatial autocorrelation (LISA maps)  
Moran's I

*Readings:*  
1. Lloyd, Chapter 8  
2. Scott and Janikas (2010)

*NB: Want to read ahead? Voss (2006) builds on today's concepts to next week's class on regression.*

Assignment #9 due.

### **Class 13: December 5. Spatial regressions**

*Topics:*  
Spatial dependence vs. spatial lags  
Geographic Weighted Regression

*Readings:*  
1. Voss et al (2006)  
2. South and Crowder (2011)  
3. Tolnay et al. (1996)  
4. Matthews and Yang (2012) and Yang and Matthews (2012)

Assignment #10 due.

*NB: We will not have an assignment on this topic. If you wish to use this method in your final assignment, please experiment with it soon after this class and see me early for help, if needed.*

### **Class 14. December 13. Raster calculations** (Note that this used to be the official "reading day")

*Topics:*  
Which types of questions are better suited to these calculations?  
Zonal statistics  
Differences between vector and raster data in these calculations

*Readings:*  
1. Lloyd, Chapter 10  
2. McGranahan et al. (2007)  
3. McDonald et al. (2011)

*NB: We will not have an assignment on this topic. If you wish to use this method in your final assignment, please experiment with it soon after this class and see me early for help, if needed.*

### **Class 15. December 15-21. Exam week**

I will be available in my office at Baruch College to answer questions about on your final assignment. Please email for an appointment.

**Final Assignment due: 21 December 2012**

**To be turned in as hard copy or a single pdf file, by 4:15 PM.**