**Pharmaceutical Policy and Economics Concentration**

The Pharmaceutical Policy and Economics concentration prepares students to learn about pharmaceutical policy in the US and abroad and analyze the impact of such policy. Students learn how to select the optimal study design to answer a research question and, through research rotations and practica, gain skills in primary data collection and secondary data analysis. Students in this concentration can tailor their coursework to develop expertise in the methodologies and content of greatest interest to them.

**REQUIRED COURSEWORK FOR PHARMACEUTICAL POLICY AND ECONOMICS CONCENTRATION**

(\* denotes that course is required for all DPOP PhD students)

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| **Topic/course** | **Credit hours** |
| \* DPOP 803. Social and Behavioral Aspects of Pharmaceutical Use(Fall Semester Odd Years) | 3 |
| \* DPOP 806. Pharmaceutical Policy (Fall Semester Even Years) | 3 |
| \* DPOP 872. Proposal Writing (Fall Semester Even Years) | 3 |
| \* DPOP---. Implementation Science (New course! Number to be determined) | 1.5 |
| \* PHRS 801. Ethics (Fall Semester) | 1 |
| \* PHRS 899. DPOP Student and Faculty Seminar (Fall and Spring Semesters) | 4 |
| \* PHRS 994. Doctoral Dissertation | 6 |
| \* EPID 710. Fundamentals of Epidemiology (Fall Semester Odd Years) | 5 |
| EPID 765. Methods and Issues in Pharmacoepidemiology (Spring Semester) | 3 |
| Statistics (see notes below) | 9 |
| Electives (see notes below) | 9 |
| **Minimum required total** | **48.5** |
| ***Strongly Recommended*** DPOP 870. Pharmaceutical Outcomes Research Methods for students in 2nd or 3rd year, focuses on the implementation of advanced methods in pharmaceutical outcomes research (Spring Semester Odd Years) | 3 |

**STATISTICS COURSES**

Students are required to take a minimum of 9 credit hours of statistical coursework. A number of departments offer statistical courses. Students are encouraged to review the following statistical series and select the series that is of greatest interest to them. Different departments teach using different statistical software programs, so students should consider this when selecting a statistical series.

**Recommended Statistics Sequence Courses:**

* **HPM 881.** **Linear Regression Models**(3 credits). Permission of instructor required (with exception of HPM PhD students). Prerequisite: BIOS 600 or equivalent background in probability theory/statistics for students lacking the prerequisite. Required preparation, matrix algebra, derivatives, logs/exponentials, and Stata. This course is an introduction to linear regression models. Topics include least squares regression, multicollinearity, heteroscedasticity, autocorrelation, and hypothesis testing.
* **HPM 882.** **Advanced Methodology for Health Policy and Management Research**

(3 credits). Prerequisite: HPM 881, or permission of the instructor. Research methodology as applied to understanding problems in health care delivery. Topics include simultaneous equation models, factor analysis, limited dependent variables, and an introduction to event history analysis.

* **HPM 883.** **Analysis of Categorical Data**(3 credits) Prerequisite: HPM 881 and HPM 882 or equivalent. This course is an introduction to the analysis of categorical data using maximum likelihood estimation (MLE) and other non-linear techniques and specification tests. Topics covered include models in which the dependent variable is not continuous, including logit, probit, censored data, two-part, and count models.

**OR**

* **ECON 700. Basic Quantitative Techniques** (3 credits) Topics from linear algebra, calculus, linear and nonlinear programming, and the theory of difference and differential equations with applications to economics. (Summer)
* **ECON 770. Introduction to Econometric Theory** (3 credits) Probability theory, expectation, conditional expectation, modes of convergence, limit and interchange theorems, and the asymptotics of maximum likelihood, generalized method of moments and efficient method of moments. (Fall)
* **ECON 771. Econometrics** (3 credits) Standard first year course in econometric theory and methods. Topics include least squares and maximum likelihood, asymptotic theory, classic inference, GMM, seemingly unrelated regression, endogeneity bias, and multi-stage least squares. (Spring)
* **ECON 870. Advanced Econometrics** (3 credits) ECON 870 constitutes a one-semester treatment of the fundamental theory of econometrics. Topics covered include asymptotic distribution theory, linear and nonlinear models, specification testing techniques, and simultaneous equations models. Prerequisites: ECON 770, 771, and MATH 547.

**Alternative Statistics Sequence Courses:**

**Biostatistics**

* **BIOS 600. Principles of Statistical Inference** (3 credits). Required preparation, knowledge of basic descriptive statistics. Major topics include elementary probability theory, probability distributions, estimation, tests of hypotheses, chi-square procedures, regression, and correlation.
* **BIOS 545. Principles of Experimental Analysis (3 credits).** Permission of the instructor for nonmajors. Required preparation, basic familiarity with statistical software (preferably SAS able to do multiple linear regression) and introductory biostatistics, such as BIOS 600. Continuation of BIOS 600. Analysis of experimental and observational data, including multiple regression and analysis of variance and covariance.
* **BIOS 665.** **Analysis of Categorical Data** (3 credits). Prerequisites, BIOS 545, 550, and 662; or permission of the instructor for students lacking the prerequisites. Introduction to the analysis of categorized data: rates, ratios, and proportions; relative risk and odds ratio; Cochran-Mantel-Haenszel procedure; survivorship and life table methods; linear models for categorical data. Applications in demography, epidemiology, and medicine.

**SOCIOLOGY (Uses Stata)**

* **SOCI 708.** **Statistics for Sociologists**(4 credits) Provides an introduction to probability theory, descriptive statistics, inferential statistics, and the algebra of expectations. Emphasis is on elements useful to research sociologists, including bivariate regression and correlation.
* **SOCI 709.** **Linear Regression Models** (4 credits) The course presents regression analysis and related techniques. The major topics are the assumptions of the regression model, dummy variables and interaction terms, outlier diagnostics, multicollinearity, specification error, heteroscedasticity and autocorrelation. The final section introduces path analysis, recursive models, and nonrecursive systems.
* **SOCI 711.** **Analysis of Categorical Data** (3 credits) Perquisite, permission of the instructor. Introduction to techniques and programs for analyzing categorical variables and nonlinear models. Special attention is given to decomposition of complex contingency tables, discriminant function analysis, Markov chains, and nonmetric multidimensional scaling.
* **SOCI 717.** **Structural Equations with Latent Variables** (3 credits) Prerequisite, SOCI 708 or permission of the instructor for students lacking the prerequisite. This course examines models sometimes referred to as LISREL models. Topics include path analysis, confirmatory factor analysis, measurement error, model identification, nonrecursive models, and multiple indicators.
* **SOCI 718.** **Longitudinal and Multilevel Data Analysis** (3 credits) Prerequisite SOCI 709 or 711. This course provides an introduction to event history analysis or survival analysis, random effects and fixed effects models for longitudinal data, multilevel models for linear and discrete multilevel data, and growth curve models.

**Education (Uses SPSS)**

* **EDUC 710.** **Statistical Analysis of Educational Data I** (4 credits). Studies descriptive and inferential statistics for educational research, including an introduction to fundamentals of research design and computer data analysis. (Fall & Summer)
* **EDUC 784.** **Statistical Analysis of Educational Data II** (4 credits). Prerequisite, EDUC 710 or permission of the instructor. A linear model approach to the analysis of data collected in educational settings. Topics include multiple regression, analysis of variance, and analysis of covariance, using computer packages. (Spring & Summer)
* **EDUC 884.** *Statistical Analysis of Educational Data III* (3 credits). An extension of the general linear model to analysis of educational data with multiple dependent variables, with computer applications. (Fall & Summer)
* **EDUC 888.****Introduction to Structural Modeling** (3 credits). Introduces structural equation modeling with both observed and latent variables. Applications include confirmatory factor analysis, multiple group analyses, longitudinal analyses and multitrait-multimethod models. (Spring)

**Social Work**

* **SOWO 916.** **Structural Equation Modeling** (3 credits). In this course, students will learn fundamental concepts and skills to conduct structural equation modeling and will learn how to apply these techniques to social work research.
* **SOWO 917.** **Longitudinal and Multilevel Analysis** (3 credits) This course introduces statistical frameworks, analytical tools, and social behavioral applications of three types of models: event history analysis, hierarchical linear modeling (HLM), and growth curve analysis.
* **SOWO 918.** **Applied Regression Analysis and Generalized Linear Models**(3credits) Prerequisite, permission of the instructor. This course introduces statistical frameworks, analytical tools, and social behavioral applications of OLS regression model, weighted least-square regression, logistic regression models, and generalized linear models.

**ELECTIVE COURSES**

**Strongly Recommended: Additional methods training that can count toward the 9-credit elective requirement.** We highly recommend students in the pharmaceutical policy and economics concentration take advanced methods courses beyond the requirements listed above. Students should consult regularly with their advisor to select from many available options. A number of graduate level elective courses that are relevant are offered at UNC. We list several below but encourage students to review course offerings each semester to find courses that match their research and career interests.

**Health Policy and Management**

* **HPM 715. Health Economics for Policy and Management(3 credits).** Provides training in the theory of health economics and applies this theory to important issues in health policy and management.
* [**HPM 757**](https://sph.unc.edu/files/2014/03/hpm757_syllabus.pdf)**. Health Reform: Political Dynamics and Policy Dilemmas (3 credits)**. This course focuses on the political and policy dynamics of health care reform.
* [**HPM 758**](https://sph.unc.edu/files/2014/06/hpm_758_syllabus.pdf)**.** **Underserved Populations and Health Reform** **(3 credits)**. Students will gain an understanding of how the changes in the health care market affect care for underserved populations and will develop strategies to ensure that the needs of these populations are met.
* [**HPM 759**](https://sph.unc.edu/files/2016/03/hpm759_syllabus.pdf)**. Health Policy Development and Advocacy for Health Leaders (2 credits).**Executive Doctoral Program in Health Leadership (DrPH). The course will familiarize students with the history of health reform in the US, explore issues in health policy, analyze the impact of health politics on policymaking.
* [**HPM 762**](https://sph.unc.edu/files/2014/06/hpm_762_syllabus.pdf)**. Quality of Care (3 credits).**The quality of health care in the US has garnered significant attention. This course will examine: (1) the current state of the quality of care in the US; (2) approaches to assess quality of care, and (3) strategies that have been implemented or proposed to improve the quality of care.
* **HPM 772. Techniques for the Economic Evaluation of Health Care** (3 credits). This course provides an investigation of the theory, methods, and application of economic evaluation to health care. Topics include methods used to structure an economic evaluation, measure and summarize health outcomes and estimate their value to patients or to the public, and identify resources used and estimate their costs. Prerequisite, [EPID 600](https://catalog.unc.edu/search/?P=EPID%20600).
* HPM 785 *Advanced Decision Modeling* (3). This course covers advanced decision modeling methods in health care, including probabilistic sensitivity and value of information analysis, economic evaluation using clinical trial data, and discrete event simulation and agent-based/system dynamics modeling techniques. The course teaches analytical techniques and interpretation as well as and state-of-the-art best practices. Prequisite: HPM 772.
* **HPM 815. Graduate Health Economics Seminar** (1 credit). Permission of the instructor. Discussion of recent papers in health economics. Students must have solid knowledge of graduate microeconomics theory and econometrics.

**Public Policy**

* **PLCY 716.** **Politics and Public Policy Theory** (3 credits). Students build a theoretical foundation about the politics of policymaking. We examine the governmental institutions and actors that make policy decisions, incentive structures, and influences that shape these decisions as well as the macro-environment within which policy demands arise and policy decisions are made.
* **PLCY 788.** **Advanced Economic Analysis for Public Policy I** (3 credits). This course introduces microeconomic theory using multivariate calculus and constrained optimization. Topics covered include consumer theory, producer theory, market equilibrium, taxes, and market power. Applied public policy examples are incorporated.
* **PLCY 789.** **Advanced Economic Analysis for Public Policy II** (3 credits). This course provides further applications of economic theory to public policy including risk and uncertainty, information economics, general equilibrium and welfare policy, externalities, public goods and taxation, and game theory. Prerequisite, PLCY 788.

**Economics**

* **ECON 698. Philosophy, Politics, and Economics: Capstone Course** (3 credits) Permission of the department. This capstone course advances PHIL 384, focusing on such theoretical and philosophical issues as the analysis of rights or distributive justice and the institutional implications of moral forms.
* **ECON 810. Game Theory I** (3 credits) Noncooperative games in strategic and extensive form, with perfect and imperfect information. Other topics from: information economics, mechanism design, auctions, repeated games, bargaining, bounded rationality, learning, evolutionary games, cooperative games.
* **ECON 840. Advanced Finance: Expenditure** (3 credits) Analysis of market failure and reasons for public spending, cost-benefit analysis and program budgeting, public decision making, redistribution and fiscal equity, intergovernmental transfers.
* **ECON 850. Health Economics** (3 credits). Measurement and modeling of the demand for medical care, the demand for and supply of health insurance, and the incorporation of health, medical care, and health insurance in determining both short and long run labor supply. Prerequisites: ECON 710 (Advanced Microeconomic Theory) and 771 (Econometrics); permission of the instructor for students lacking the prerequisites.
* **ECON 851. Health Economics for Developing Countries** (3 credits). Major topics are: how health and development are related, the demand for health services, cost-benefit and cost-effectiveness analysis, and methods for financing health care in developing, resource-constrained nations. Prerequisites: ECON 710 (Advanced Microeconomic Theory) and 771 (Econometrics); permission of the instructor for students lacking the prerequisites.
* **ECON 873. Microeconometrics** (3 credits). Limited dependent variable models such as binary outcome models, multinomial outcome models, and censored and truncated outcome models. Count data models. Duration models. Panel data analysis. Prerequisite: ECON 870.
* **ECON 880. Labor Economics** I (3 credits). Analysis of short- and long-run aspects of supply and demand of labor, including empirical analysis of labor force behavior of males, females, blacks, and whites. Microeconomic effects of marriage, fertility, mobility on labor supply, and macroeconomic effects of unemployment on inflation. Prerequisite: ECON 710; permission of the instructor for students lacking the prerequisite.
* **ECON 881. Labor Economics II** (3 credits). This course covers a range of topics in labor economics, with a unifying theme of understanding how economics informs policies for alleviating inequality. Topics include social interactions, education, early childhood intervention, and discrimination.