PUT YOUR NAME AND TEMPLE ID HERE: ________________________________

CJ 605
STATISTICS 2
MULTILEVEL MODELS IN CRIMINAL JUSTICE
SPRING 2006

PART I. In this part you will see and interpret printout from HLM runs. (40%)

The data set used here was NOT the PAS 2003 Philadelphia data. Rather it came from a summer 2002 survey completed by the Philadelphia Health Management Corporation (PHMC). There were over 4,000 interviews completed. It was an RDD survey. Households were randomly selected using telephone number lists. All households were within Philadelphia. Adults within each household were randomly sampled using the "last birthday" method – the adult with the most recent birthday was selected as the designated respondent. This is an acceptable and widely used way to randomly sample within households. In short, there was a good probability sample of adults within Philadelphia households. Weights were applied to make the sample representative of adults in Philadelphia households in 2002. In short, you can treat these data as representative, just like the 2003 PAS data.

Respondents were aggregated into 45 PHMC neighborhoods. As you can see if you do the math (4000+ / 45) there were a lot of respondents in each neighborhood.

Answer the questions about the printout. The information you need comes BEFORE the question.

BMI is body mass index. It is an adjusted ratio of weight to height. Higher scores generally mean more body fat. BMI can be a leading indicator of weight-related health problems.[1] As described by NHLBI (National Heart, Lung, and Blood Institute), the categories are:

- **Underweight = <18.5**
- **Normal weight = 18.5-24.9**
- **Overweight = 25-29.9**
- **Obesity = BMI of 30 or greater**

If you later want to calculate your own BMI (although all you folks are way too young to worry about this kind of stuff) you can go to:

http://nhlbisupport.com/bmi/bmicalc.htm

[1] Their web site also tells us: "BMI is a reliable indicator of total body fat, which is related to the risk of disease and death. The score is valid for both men and women but it does have some limits."[http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/risk.htm]

Philadelphia has been in the news in recent years as one of the most skinny-challenged cities in the country.[2] As you may know, Mayor Street really pushed fitness during his first administration. Given the health relevance of this outcome, and your reading of Morenoff on health, it was thought this would be an interesting outcome to consider.

Analyzing this outcome, the ANOVA model showed the following:

Table 1

Final estimation of variance components:

Random Effect		Standard Deviation	Variance Component	df	Chi-square	P <
INTRCPT1,	U0	1.31360	1.72554	44	246.29496	0.001
level-1,	R	6.24310	38.97634			

1. The between-neighborhood component of the BMI index is essentially zero. T F

2. The between-neighborhood portion of the total variance of the BMI is at least 30%. T F

3. In the population of households from which these surveys were sampled, it is safe to say that the neighbor-to-neighbor differences **WITHIN** neighborhoods on the BMI make up only a very tiny fraction of the total variance T F

Given that those residents who live in high crime neighborhoods might restrict their behaviors more because of concerns about personal safety[3], it seemed plausible to expect that the average BMI would be higher in higher crime neighborhoods. The next model entered the annualized violent crime rate, expressed as **reported violent crimes / 100,000 persons**, for the period 1/1/01 through 6/30/02, to predict BMI. The Violent

[2] Look at the Phillies Phanatic, for example. Also, do you know of any other major league mascot that shoots **hot dogs** at the fans?

[3] Ross, Catherine. 1993. "Fear of Victimization and Health." *Journal of Quantitative Criminology* 9:159 175.

crime rate VIOLRAYR was grand mean centered in the model shown below. This crime variable is the same one you have been working with in your PAS file.

Table 2

```
Final estimation of fixed effects
 (with robust standard errors)
 ----------------------------------------------------------------------------
                                        Standard             Approx.
    Fixed Effect         Coefficient    Error      T-ratio   d.f.     P <
 ----------------------------------------------------------------------------
 For       INTRCPT1, B0
    INTRCPT2, G00          27.519042    0.185391   148.437        43    0.001
    VIOLRAYR, G01           0.001071    0.000156     6.877        43    0.001
 ----------------------------------------------------------------------------
Final estimation of variance components:
 -----------------------------------------------------------------------------
 Random Effect             Standard      Variance     df    Chi-square  P-value
                           Deviation     Component
 -----------------------------------------------------------------------------
 INTRCPT1,       U0          1.06294       1.12985    43     187.76633    0.001
  level-1,       R           6.24165      38.95818
 -----------------------------------------------------------------------------
```

4. The average BMI of an average Philadelphia adult householder living in a neighborhood with an average violent crime rate, is in the **underweight** category (interpret G00) T F

5. After controlling for neighborhood violent crime rates, there were **no remaining significant** neighborhood-to-neighborhood differences in average BMI – the remaining ecological differences were just noise. T F

6. For each unit increase in reported annual violent crime rate per 100,000 residents, the BMI index went up 10.71 T F

7. It appeared that neighborhoods with a LOWER violent crime rate had residents with a HIGHER average BMI – exactly opposite the hypothesis T F

The next model (see below) looked at the effects of the neighborhood-level reported violent crime rate after controlling for a number of individual level variables. Predictors included NPOV150, separating those ABOVE 150% of the poverty line (score=2) from those at or below 150% of the poverty line (scoring 1); respondent age (RESPAGE), in years; a dummy (FEMALED) for gender (1=FEMALE, 0=MALE); and a dummy for nonwhite (NONWHID) (1=nonwhite; 0=white). MARRD was a dummy for married (1) or not (0), OWND was a dummy for owner (1) or renter (0). Predictors also included XHALF, the number of days / week the respondent exercised for 30 minutes or more a day. The response categories were not the number of days but were as follows (0=none):

XHALF Q50 Days per week exercise >= 30 minutes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	723	17.9	18.0	18.0
	1 < once a week	604	14.9	15.0	33.0
	2 1-2 days/week	840	20.7	20.8	53.8
	3 3 days a week	691	17.0	17.2	71.0
	4 > 3 days a week	1170	28.9	29.0	100.0
	Total	4028	99.4	100.0	
Missing	System	25	.6		
Total		4052	100.0		

In this next model XHALF was allowed to have a **varying** slope across neighborhoods. Here are the results of the run. XHALF and VIOLRAYR were both grand mean centered; all the other predictors were **uncentered**.

Table 3

```
The outcome variable is      BMI

 Final estimation of fixed effects
 (with robust standard errors)
 ----------------------------------------------------------------------------
                                        Standard                Approx.
    Fixed Effect         Coefficient   Error      T-ratio   d.f.     P <
 ----------------------------------------------------------------------------
 For       INTRCPT1, B0
    INTRCPT2, G00          27.025586   0.650738   41.531         43    0.001
    VIOLRAYR, G01           0.000681   0.000154    4.414         43    0.001
 For  RESPAGE slope, B1
    INTRCPT2, G10           0.037374   0.005435    6.877       4124    0.001
 For    XHALF slope, B2
    INTRCPT2, G20          -0.353114   0.072662   -4.860         44    0.001
 For  NPOV150 slope, B3
    INTRCPT2, G30          -1.088604   0.298778   -3.644       4124    0.001
 For  FEMALED slope, B4
    INTRCPT2, G40          -0.154686   0.220129   -0.703       4124    0.5
 For  NONWHID slope, B5
    INTRCPT2, G50           0.891546   0.265041    3.364       4124    0.001
 For     OWND slope, B6
    INTRCPT2, G60           0.385099   0.294393    1.308       4124    0.2
 For    MARRD slope, B7
    INTRCPT2, G70          -0.005142   0.210497   -0.024       4124    0.98
 ----------------------------------------------------------------------------

 Final estimation of variance components:
 -----------------------------------------------------------------------------
 Random Effect            Standard      Variance     df    Chi-square  P-value
                          Deviation     Component
 -----------------------------------------------------------------------------
 INTRCPT1,       U0         0.85883       0.73759    43     124.51414    0.001
    XHALF slope, U2         0.16077       0.02585    44      48.26752    0.30
  level-1,       R          6.15523      37.88689
 -----------------------------------------------------------------------------
```

8. After controlling for the individual level predictors in the model, the reported violent crime rate <u>no longer</u> had a significant impact on neighborhood average BMI scores. T F

9. After controlling for all the predictors in the model, at both Levels 1 and 2, NO significant ecological variation remained in the outcome. T F

10. After controlling for other individual and neighborhood predictors, Nonwhite respondents compared to other respondents in Philadelphia were .89 HIGHER on the BMI index. T F

11. In the **population** of adult Philadelphia householders from which this sample was drawn, the difference between owners and renters on BMI, after controlling for other factors shown in the model, AND for neighborhood context, was essentially zero (i.e., not statistically significant) T F

12. After controlling for the other predictors shown and neighborhood context, there was <u>no</u> appreciable difference between men and women on BMI in the **population** of adult Philadelphia householders. T F

13. In the **population** of adult Philadelphia householders, it looked like more frequent exercise (XHALF) linked to lower BMI, after controlling for the other factors in the model and for neighborhood context. T F

14. It looked like there WERE significant neighborhood-to-neighborhood differences in the impact of exercise (XHALF) on BMI – i.e., the slope varied **significantly** across neighborhoods. T F

PART 2. You are going to read excerpts from two articles using HLM and answer questions. (50%)

Pam Wilcox (Rountree) and Richard Clayton published a 2001 article in JQ looking at the determinants of weapon possession among secondary school students. Here is the abstract:

> In this study we present and estimate a multilevel model of weapon possession by students. Our approach extends existing research through an emphasis on the simultaneous effects of individual-level factors including fear, victimization, criminal lifestyle, pro-gun socialization, and social engagement, as well as school-level contextual factors including various indicators of school structure, school capital, and school deficits. We estimate multilevel main effects using hierarchical logistic regression methods and data from more than 6,000 students in 21 schools in Louisville, Kentucky. Results indicate that the likelihood of carrying a weapon to school varies not only across individuals but across schools. School-level structural characteristics—especially SES—were significant in accounting for some of this cross-school variation. Further, the effects of SES on weapon carrying were mediated by school capital and school deficits.

LEVEL 1 was students (6,000+) in grades 6 through 12
LEVEL 2 was schools – 21 schools in one Kentucky County

Their conceptual model appears below:

In this study we present and estimate a multilevel model of weapon possession by students. Our approach extends existing research through an emphasis on the simultaneous effects of individual-level factors including fear, victimization, criminal lifestyle, pro-gun socialization, and social engagement, as well as school-level contextual factors including various indicators of school structure, school capital, and school deficits. We estimate multilevel main effects using hierarchical logistic regression methods and data from more than 6,000 students in 21 schools in Louisville, Kentucky. Results indicate that the likelihood of carrying a weapon to school varies not only across individuals but across schools. School-level structural characteristics—especially SES—were significant in accounting for some of this cross-school variation. Further, the effects of SES on weapon carrying were mediated by school capital and school deficits.

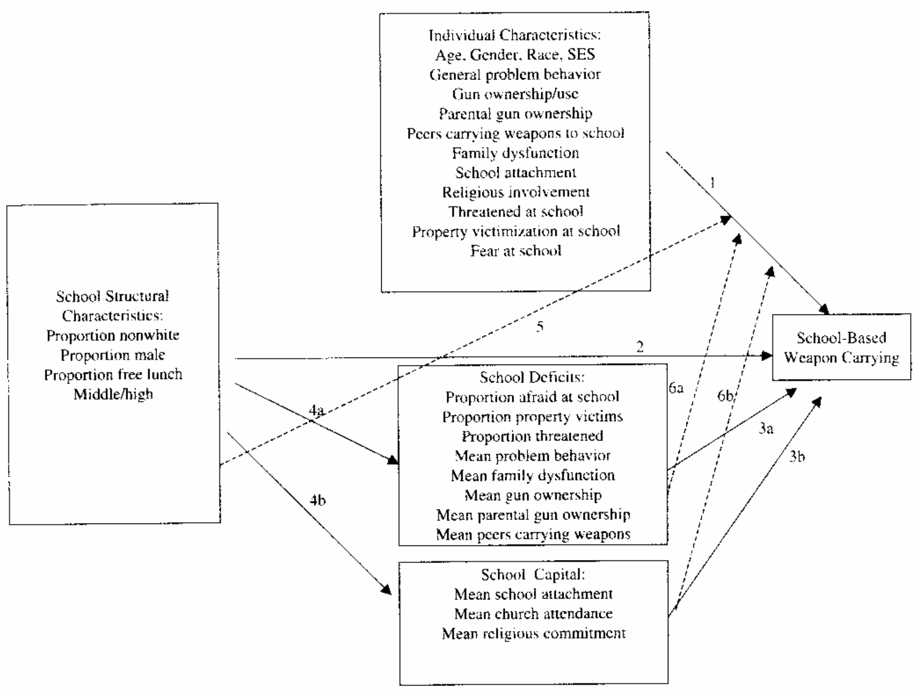

Figure 1. Conceptual Multilevel Model of School-Based Weapon Carrying

Their level 1 model was explained as follows:

The general level 1 model estimated for each individual student (i) in school (j) takes the following form:

$$\text{logit}(\text{WEAPON CARRYING}_{ij}) = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \ldots \beta_{kj}X_{kij} + e_{ij} \qquad (1)$$

where $X_1, X_2, \ldots X_k$ represent individual-level variables, the β_{kj} values are logistic regression coefficients (or intercepts, as in the case of β_{0j}), and e_{ij} is a level 1 error term assumed to be distributed binomially.[4]

Their level 2 model was explained as follows:

The level 2, or school-level, model is a normal-errors regression model of the following general form:

$$\beta_{kj} = \Theta_{k0} + \Theta_{k1}W_{1j} + \Theta_{k2}W_{2j} + \ldots \Theta_{kq}W_{qj} + u_{kj} \qquad (2)$$

where $W_1, W_2, \ldots W_q$ represent school-level variables, the Θ_{kq} values are regression coefficients (or intercepts) to be estimated, and u_{kj} is a normally distributed error term.

The outcome variable was explained as follows:

Adolescents' in-school weapon possession is the dependent variable for this study. Weapon possession at school is measured by a dichotomous variable indicating whether or not sampled students reported having taken a weapon to school within the 30 days preceding the survey (1 = yes; 0 = no).[8] Table 1 displays the descriptive

The authors noted in a footnote that "although the wording of the question does not allow for precise identification of the type of weapons to which students referred, comparison of this item with other items suggests that students did not regard "pocket knives" as weapons."

Given their above specified model, consider the following questions:

15. The outcome was binary T F

16. The model suggested differences between schools on the outcome would appear. T F

17. The above conceptual model (figure, not equations) suggests that the impacts of some individual predictors might vary (i.e., might have varying impacts) across schools.
T F

18. The conceptual model (figure, not equations) suggests school structural characteristics could affect school deficits. T F

Here is some information about their data sources. You do NOT need to know all these details to answer the questions, but if you want these details, here they are. Suggest you SKIP IT NOW and try and answer the questions first, coming back if you feel you need to.

The individual-level explanatory variables used in this study represent concepts from several of the competing explanations, reviewed earlier, for adolescents' weapon carrying. First, we control for sociodemographic differences across students that might explain weapon-carrying patterns, including sex, age, race, and socioeconomic status. Sex and race are measured by dichotomous variables (male = 1, female = 0; nonwhite = 1, white = 0). Age is measured by a continuous variable tapping actual age in years. To examine the possibility that the age effect may be curvilinear, we also calculate and include a term for age squared.

Socioeconomic status is measured by an index summing the responses to two ordinal-scale survey items on the level of education attained by the respondent's father and mother. The sum is weighted (multiplied) according to the inverse proportion of composite items with valid data. Each question on parental education contained response categories ranging from 1 (grade school or less) to 7 (graduate or professional school after college). In the resulting index, possible values range from 2 to 14; higher values presumably represent higher socioeconomic status.[10,11]

As Table 1 indicates, the sample studied here is divided fairly evenly in gender composition and is relatively diverse in racial composition: 35 percent of the students are nonwhite. The students, on average, are between 14 and 15 years old and are slightly above the midpoint of the SES scale.

As stated earlier, some observers have suggested adolescents' weapon carrying may be an extension of a general pattern of problematic behaviors. Thus the present study includes a "problem behavior" index (alpha = .76) achieved by summing scores (and multiplying by the inverse proportion of indexed items with valid data) on eight dichotomous measures. These measures indicate whether or not the respondent ever (1) had been referred to talk to someone because he or she used alcohol or drugs, (2) had received counseling because of behavior or moods, (3) had been hospitalized because of behavior or moods, (4) had been placed in a special class or school because of behavior, (5) had been placed in an alcohol or drug treatment program, (6) had been arrested, (7) had been placed in a jail or detention center, or (8) had sold drugs.

Weapon-related socialization is another theoretical explanation that received attention in previous work. In this study, we measure gun and/or weapon ownership or carrying by parents, peers, and the respondent himself or herself in order to tap possible pro-weapon socialization. We use three distinct measures. First, we employ a dichotomous measure indicating whether or not the respondent's parents own a gun, including either a handgun or a rifle. Nearly half of the students in the sample indicated such ownership.

A second measure, tapping individually based gun-related experiences, is an index representing the weighted sum of four survey items (alpha = .73) indicating whether or not the respondent owned a handgun, owned a rifle, hunted, or had ever taken a gun safety course. Finally, we measure peers' weapon carrying by a single item asking respondents how many of their five best friends had brought a weapon to school in the previous 12 months. On average, fewer than one friend was reported as having done so.

To tap the level of social engagement, we include measures of family dysfunction, school attachment, and religious ties. Family dysfunction, as an indicator of weak social engagement (at least at the level of family), is measured with an index (alpha = .62) indicating the total number of dysfunctional attributes associated with the respondent's family: whether or not (1) a parent of the respondent had ever spent time in prison or jail, (2) a parent of the respondent had ever sought help for drug or alcohol problems, (3) a parent of the respondent had ever been in a psychiatric hospital, or (4) the respondent had ever been placed in a foster family or in the care of the state.[12] Table 1 shows that family dysfunction, as measured by these combined items, is relatively nonproblematic in the sample: on average, respondents indicated the presence of less than one of these four items.

School attachment is measured by another multiple-item index (alpha = .79). We summed responses to 10 dichotomous survey items examining attitudes toward teachers and school, adjusting for the number of items with valid responses. In particular, the school attachment index taps whether the respondent (1) cares what teachers think, (2) thinks most teachers like him or her, (3) likes most teachers, (4) feels that it is easy to talk to most teachers, (5) feels that it is important to do a good job on homework, (6) feels that getting good grades is important, (7) feels that getting an education is important, (8) feels good when at school, (9) thinks classes are a waste of time, and (10) would like to quit school. Scores on the last two items were reverse coded before being combined into the index.

Finally, we measure another indicator of social engagement — religious ties — by an index combining two survey items (alpha = .73). First, students were asked how often they attend religious services. Responses ranged from 1 (never) to 6 (more than once a week). Second, students were asked how important religion was in their lives; responses ranged from 1 (not important at all) to 4 (very important). Because different metrics were associated with the response categories for these two items, we used summed z-scores in constructing the index.

We also include in our models several measures of students' risk and fear of victimization. School-based victimization is measured with two distinct dichotomous variables: whether or not the student was threatened at school within the year preceding the survey (including the past 30 days), and whether or not any of the student's property had been stolen at school during this period (1 = yes, 0 = no for both measures). A final dichotomous variable measures whether or not students admit to "being afraid of some students at school" (1 = yes, 0 = no). Figures displayed in Table 1 show that 24 to 29 percent of students have been victimized at school by having been threatened or having had property stolen. Similarly, one-third of students report being afraid of someone at school.[13]

As mentioned above, we employed group-mean substitution on cases missing on several of the above variables, including SES, religiosity, peers' weapon carrying, and the indexes for school attachment, family dysfunction, and respondents's weapon ownership/use. To discern whether the missing cases were different, however, we created six dummy-coded "missing-data flags" indicating whether or not (1 = yes; 0 = no) cases were missing on each of the six measures incorporating imputed values. In the models shown below, we retained only the missing-data flags that were significant.

In addition to measuring individual-level risk factors associated with students' weapon possession, we included school-level measures thought to exert either direct or mediating effects. For instance, we measured school structure by proportion male, proportion nonwhite, school-level SES (indicated by the proportion of students eligible for free lunches), and a dummy variable indicating whether the school was a middle (1 = yes) or a high school. Proportion male, proportion nonwhite, and proportion eligible for free lunch were obtained from 1996 Kentucky Department of Education records.

Finally, we created measures of school deficits and school capital by combining into indexes school-level analogs of several of the individual-level measures discussed earlier. "School deficits" (alpha = .84) combines measures of school-level proportion of students afraid, proportion of students threatened, proportion experiencing property victimization, school-level mean problem behavior, school-level mean family dysfunction, mean gun ownership/use among students, mean parental gun ownership among students, and school-level mean weapon carrying by peers. We created the index for deficits by summing within schools the z-scores associated with each of these measures. Another concept, school capital, combines mean school attachment, mean church attendance, and mean religious commitment (alpha = .83). We also used summed z-scores in constructing this index.[14]

Correlations among all study variables described here are shown in Appendix Table A2. All nonstandardized measures were centered on the grand mean for analysis.

Below are the results from the ANOVA. REMEMBER: because this is a binary outcome, there is no level 1 variance shown (**ignore** the extra-binomial error term). ASSUME THAT ANY COEFFICIENT OR VARIANCE COMPONENT THAT IS **AT LEAST TWO TIMES LARGER THAN ITS STANDARD ERROR** IS STATISTICALLY SIGNIFICANT.

Table 2. Intercept-Only (Null) Model of School-Based Weapon Carrying

Fixed Effects	Coefficient	SE
School Mean Carrying	–3.02	.11
Random Effects	**Variance Component**	**SE**
Mean weapon carrying, u_{0j}	.16	.07
Level 1 extra-binomial error, e_{ij}	.95	.02

NOTE: N = 6,169 students, 21 schools

19. The above results show there IS significant between-school variation on this outcome T F

The next table below shows you the results when student-level variables were entered. The remaining between-school outcome variation became NON SIGNIFICANT after these were entered.

Table 3. Hierarchical Logistic Regression Model of School-Based Weapon Carrying with Individual-Level Covariates

Fixed Effects	Coefficient	SE	Exp. Coeff.
School mean carrying	−4.35	.12	—
Sex (male)	.27*	.14	1.31
Age	1.78*	.53	5.91
Age^2	−.05*	.02	.95
Race (nonwhite)	.40*	.14	1.48
SES	−.07*	.02	.93
Problem behavior	.16*	.03	1.17
Parental gun ownership	.28*	.14	1.33
Self gun ownership/use	.25*	.05	1.28
Peers carrying weapons to school	.55*	.04	1.73
Family dysfunction	.01	.06	1.01
School attachment	−.18*	.02	.84
Religious ties	−.06	.04	.94
Threatened at school	.92*	.14	2.52
Property stolen at school	.50*	.13	1.65
Afraid at school	.17	.14	1.18
Peers carrying weapons missing	.68*	.18	1.98
Random Effects	**Variance Component**		**SE**
Mean weapon carrying, u_{0j}	.06		.04
Level 1 extra-binomial error, e_{ij}	.72		.01

NOTE: N = 6,169 students, 21 schools
* $p < .05$

20. Controlling for school context, and other predictors, those students who reported parental gun ownership were **significantly more likely** to report recently carrying a weapon to school. T F

21. Controlling for school context and other predictors, those students who reported being more afraid at school were **significantly more likely** to report recently carrying a weapon to school. T F

22. Compositional differences in the students going to the different schools have explained away the significant between-school differences on the outcome. T F

The table immediately below is from Sampson and Bartusch's paper on legal cynicism across Chicago neighborhoods. The data set is several thousand interviews (7,000+)

across 300+ neighborhoods. Level 1 represents individuals; level 2 represents neighborhoods.

The outcome in question is legal cynicism. A higher score means the respondent is more cynical about laws. The items are also shown immediately below. There was NO centering of Level 1 predictors. Concentrated disadvantage is a neighborhood-level factor including racial composition and socioeconomic status indicators. A higher score means more disadvantage.

Legal cynicism[c]
Laws to be broken
Okay to do anything you want
No right/wrong ways to make money
Fighting is nobody else's business
Person has to live for today

Table 5. Hierarchical Linear Model of Legal Cynicism (Neighborhood-Level Reliability = .54): Variance Decomposition and Correlates, PHDCN Survey, 1995

	Model 1			Model 2		
	Coefficient	S.E.	*t*-Ratio	Coefficient	S.E.	*t*-Ratio
Intercept	1.852	.008	231.25**	1.850	.008	235.23**
Person level (*N* = 7,408)						
African American	.060	.017	3.58**	.022	.021	1.01
Latino American	.039	.021	1.88	.027	.023	1.18
Female	–.068	.013	–5.08**	–.069	.013	–5.15**
SES	–.089	.006	–15.58**	–.083	.006	–13.64**
Age	–.002	.000	–3.96**	–.002	.000	–3.62**
Married	–.079	.021	–3.79**	–.079	.021	–3.76**
Separated/divorced	–.050	.023	–2.20*	–.051	.023	–2.20*
Single	.011	.023	0.50	.012	.023	0.52
Own home	–.018	.016	–1.12	–.016	.016	–0.99
Residential moves	.006	.005	1.13	.008	.005	1.45
Years in neighborhood	–.000	.000	–0.36	–.000	.000	–0.63
Neighborhood level (*N* = 342)						
Concentrated disadvantage				.047	.011	3.99**
Immigrant concentration				.008	.010	0.76
Residential stability				.013	.008	1.65

	Variance Components	Variance Explained	
		Model 1	Model 2
Within neighborhoods	.291	5%	5%
Between neighborhoods	.018	56%	61%

* $p < .05$ ** $p < .01$

23. In Model 1, the results for individual level SES (higher score, higher SES) suggest that in the population of Chicago adult residents, those from HIGHER SES groups are significantly LESS cynical about the law, after controlling for neighborhood context, and for other predictors in Model 1. T F

24. Model 1 results suggest African-Americans in the Chicago population generally, as compared to other residents, after controlling for neighborhood context, are MORE cynical about the law T F

25. When the results of Model 2 are compared to the results of Model 1, they suggest: legal cynicism is STRONGER in neighborhoods where there is MORE concentrated disadvantage. T F

26. When the results of Model 2 are compared to the results of Model 1, they suggest: **individual-level** African-American racial status is NOT linked to legal cynicism after neighborhood level concentrated disadvantage has been factored in T F

PART III Deciding which HLM model to apply (10%)

What follows are a couple of sketches about research problems. For each research problem sketched out, you want to pick the type of HLM model/submodel MOST appropriate to the research question.

27. Researcher A has a data set arranged as follows: there are 250,000 records from Philadelphia, all from the calendar year 2001. Each record is from a summoned juror. Each record indicates whether the summoned juror showed up at the courthouse on the day of his/her requested service (0 = no; 1=yes). Each record also has been geocoded so that it can be placed into a census block group. There are plenty of records for each residential census block group. The researcher is interested in only one question: whether the racial composition of the census block group, and/or the SES of the census block group, influence the likelihood that the summoned citizen will show up for service on the requested day. There are no individual-level details about the summoned jurors other than their address and the outcome of the summons. The most appropriate HLM submodel/model for the researcher to answer his/her questions, once he/she has confirmed there are significant neighborhood-to-neighborhood differences in summons response, is:
    a. ANOVA
    b. ANCOVA
    c. Means as outcomes regression (MAOR)
    d. Random coefficients regression (RCR)
    e. The full model: intercepts and slopes as outcomes (IASAO)

28. Researcher B has a data set with the following elements. Surveys of prison guards are available for a number (> 50) of correctional facilities. There are around 50-100 guard interviews for each facility. Information also is available from the census of prisons about facility characteristics such as total inmate population, total number of officers, degree of overcrowding, security level, and more. The outcome of interest is guards' reported job satisfaction, from the surveys. Preliminary work already has verified that there are significant differences in the outcome across different institutions. B is interested in four things: the impacts of officer-level characteristics on the survey outcome; the impacts of facility-level characteristics like security level on the outcome; whether officer-level predictors like years working as a correctional officer have varying impacts across different facilities, and, presuming impacts of years working do vary, what facility-level factors predict those slopes. The HLM model/submodel which can best address these questions, given the above assumptions, is
    a. ANOVA
    b. ANCOVA
    c. Means as outcomes regression (MAOR)
    d. Random coefficients regression (RCR)
    e. The full model: intercepts and slopes as outcomes (IASAO)

29. Researcher C has a data set comprised of surveys from undergraduate criminal justice majors at Temple University. The dependent variable of interest to him/her is satisfaction with the course. There are about 600 surveys from about 70 different sections, and the smallest number of students completing surveys in a section is 25. No student completed more than one survey. PUTTING ASIDE that sometimes the same instructor taught more than one section, the researcher's questions are simply this: does course satisfaction vary significantly across sections?, and what percentage of the outcome is attributable to different sections? The HLM model/submodel which can best address these questions, given the above assumptions, is
    a. ANOVA
    b. ANCOVA
    c. Means as outcomes regression (MAOR)
    d. Random coefficients regression (RCR)
    e. The full model: intercepts and slopes as outcomes (IASAO)