Preparing and Presenting Effective Research Posters

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Abstract:

Objective: Posters are a common way to present results of a statistical analysis, program evaluation, or other project at professional conferences. Often, researchers fail to recognize the unique nature of the format, which is a hybrid of a published paper and an oral presentation. This methods note demonstrates how to design research posters to convey study objectives, methods, findings, and implications effectively to varied professional audiences.

Methods: A review of existing literature on research communication and poster design is used to identify and demonstrate important considerations for poster content and layout. Guidelines on how to write about statistical methods, results, and statistical significance are illustrated with samples of ineffective writing annotated to point out weaknesses, accompanied by concrete examples and explanations of improved presentation. A comparison of the content and format of papers, speeches, and posters is also provided.

Findings: Each component of a research poster about a quantitative analysis should be adapted to the audience and format, with complex statistical results translated into simplified charts, tables, and bulleted text to convey findings as part of a clear, focused story line.

Conclusions: Effective research posters should be designed around two or three key findings with accompanying handouts and narrative description to supply additional technical detail and encourage dialog with poster viewers.

Keywords: Communication; poster; conference presentation.

An assortment of posters is a common way to present research results to viewers at a professional conference. Too often, however, researchers treat posters as poor cousins to oral presentations or published papers, failing to recognize the opportunity to convey their findings while interacting with individual viewers. By neglecting to adapt detailed paragraphs and statistical tables into text bullets and charts, they make it harder to quickly grasp the key points of the poster. By simply posting pages from the paper, they risk having people merely skim their work while standing in the conference hall. By failing to devise narrative descriptions of their poster, they overlook the chance to learn from conversations with their audience.

Even researchers who adapt their paper into a well-designed poster often forget to address the range of substantive and statistical training of their viewers. This step is essential for those presenting to non-researchers but also pertains when addressing interdisciplinary research audiences. Studies of policymakers (Sorian and Baugh 2001; DiFranza et al. 1996) have demonstrated the importance of making it readily apparent how research findings apply to real-world issues rather than imposing on readers to translate statistical findings themselves.

This methods note is intended to help researchers avoid such pitfalls as they create posters for professional conferences. The first section describes objectives of research posters. The second shows how to describe statistical results to viewers with varied levels of statistical training, and the third provides guidelines on the contents and organization of the poster. Later sections address how to prepare a narrative and handouts to accompany a research poster. Because researchers often present the same results as published research papers, spoken conference presentations, and posters, Appendix A compares similarities and differences in the content, format, and audience interaction of these three modes of presenting research results. Although the focus of this note is on presentation of quantitative research results, many of the guidelines about how to prepare and present posters apply equally well to qualitative studies.

What is a research poster?

Preparing a poster involves not only creating pages to be mounted in a conference hall, but also writing an associated narrative and handouts, and anticipating the questions you are likely to encounter during the session. Each of these elements should be adapted to the audience, which may include people with different levels of familiarity with your topic and methods (Beilenson 2004; Nelson et al. 2002). For example, the annual meeting of the American Public Health Association draws academics who conduct complex statistical analyses along with practitioners, program planners, policymakers, and journalists who typically do not.

Posters are a hybrid form – more detailed than a speech but less than a paper, more interactive than either (Appendix A). In a speech, you (the presenter) determine the focus of the presentation, but in a poster session, the viewers drive that focus. Different people will ask about different facets of your research. Some might do policy work or research on a similar topic or with related data or methods. Others will have ideas about how to apply or extend your work, raising new questions or suggesting different contrasts, ways of classifying data, or presenting results. Beilenson (2004) describes the experience of giving a poster as a dialogue between you and your viewers.

By the end of an active poster session, you may have learned as much from your viewers as they have from you, especially if the topic, methods, or audience are new to you. For instance, at David Snowdon's first poster presentation on educational attainment and longevity using data from The Nun Study, another researcher returned several times to talk with Snowdon, eventually suggesting that he extend his research to focus on Alzheimer's disease, which led to an important new direction in his research (Snowdon 2001). In addition, presenting a poster provides excellent practice in explaining quickly and clearly why your project is important and what your findings mean – a useful skill to apply when revising a speech or paper on the same topic.

Writing for a varied professional audience

Audiences at professional conferences vary considerably in their substantive and methodological backgrounds. Some will be experts on your topic but not your methods, some will be experts on your methods but not your topic, and most will fall somewhere in between. In addition, advances in research

methods imply that even researchers who received cutting-edge methodological training 10 or 20 years ago might not be conversant with the latest approaches. As you design your poster, provide enough background on both the topic and the methods to convey the purpose, findings, and implications of your research to the expected range of readers.

Telling a simple, clear story

Write so your audience can understand why your work is of interest to them, providing them with a clear take-home message that they can grasp in the few minutes they will spend at your poster. Experts in communications and poster design recommend planning your poster around two to three key points that you want your audience to walk away with, then designing the title, charts, and text to emphasize those points (Nelson 2002; Briscoe 1996; Beilenson 2004). Start by introducing the two or three key questions you have decided will be the focus of your poster, and then provide a brief overview of data and methods before presenting the evidence to answer those questions. Close with a summary of your findings and their implications for research and policy.

A 2001 survey of government policymakers showed that they prefer summaries of research to be written so they can immediately see how the findings relate to issues currently facing their constituencies, without wading through a formal research paper (Sorian and Baugh 2002). Complaints that surfaced about many research reports included that they were "too long, dense, or detailed," or "too theoretical, technical, or jargony." On average, respondents said they read only about a quarter of the research material they receive for detail, skim about half of it, and never get to the rest.

To ensure that your poster is one viewers will read, understand, and remember, present your analyses to match the issues and questions of concern to them, rather than making readers translate your statistical results to fit their interests (DiFranza 1996; Nelson 2002). Often, their questions will affect how you code your data, specify your model, or design your intervention and evaluation, so plan ahead by familiarizing yourself with your audience's interests and likely applications of your study findings. In an academic journal article, you might report parameter estimates and standard errors for each independent variable in your regression model. In the poster version, emphasize findings for specific program design features, demographic, or geographic groups, using straightforward means of presenting effect size and statistical significance ; see "Describing numeric patterns and contrasts" and "Presenting statistical test results" below.

The following sections offer guidelines on how to present statistical findings on posters, accompanied by examples of "poor" and "better" descriptions – samples of ineffective writing annotated to point out weaknesses, accompanied by concrete examples and explanations of improved presentation. These ideas are illustrated with results from a multilevel analysis of disenrollment from the State Children's Health Insurance Program (SCHIP) (Phillips et al. 2004). I chose that paper to show how to prepare a poster about a sophisticated quantitative analysis of a topic of interest to *HSR* readers, and because I was a collaborator in that study, which was presented in the three formats compared here - as a paper, a speech, and a poster.

Explaining statistical methods

Beilenson (2004) and Briscoe (1996) suggest keeping your description of data and methods brief, providing enough information for viewers to follow the story line and evaluate your approach. Avoid cluttering the poster with too much technical detail or obscuring key findings with excessive jargon. For readers interested in additional methodological information, provide a handout and a citation to the pertinent research paper.

As you write about statistical methods or other technical issues, relate them to the specific concepts you study. Provide synonyms for technical and statistical terminology, remembering that many conferences of interest to policy researchers draw people from a range of disciplines. Even with a quantitatively sophisticated audience, don't assume that people will know the equivalent vocabulary used in other fields. A few years ago, the journal *Medical Care* published an article whose sole purpose was to compare statistical terminology across various disciplines involved in health services research so that people could understand one another (Maciejewski et al. 2002). After you define the term you plan to use, mention the synonyms from the various fields represented in your audience.

Consider whether acronyms are necessary on your poster. Avoid them if they are not familiar to the field or would be used only once or twice on your poster. If you use acronyms, spell them out at first usage, even those that are common in health services research such as "HEDIS®"(Health Plan Employer Data and Information Set) or "HLM"(hierarchical linear model).

Poor: "We use logistic regression and a discrete-time hazards specification to assess relative hazards of SCHIP disenrollment, with plan level as our key independent variable."

Comment: Terms like "discrete-time hazards specification" may be confusing to readers without training in those methods, which are relatively new on the scene. Also the meaning of "SCHIP" or "plan level" may be unfamiliar to some readers unless defined earlier on the poster.

Better: "Chances of disenrollment from the State Children's Health Insurance Program (SCHIP) vary by amount of time enrolled, so we used hazards models (also known as event history analysis or survival analysis) to correct for those differences when estimating disenrollment patterns for SCHIP plans for different income levels."

Comment: This version clarifies the terms and concepts, naming the statistical method and its synonyms, and providing a sense of why this type of analysis is needed.

To explain a statistical method or assumption, paraphrase technical terms and illustrate how the analytic approach applies to your particular research question and data:

Poor: "The data structure can be formulated as a two–level hierarchical linear model, with families (the level–1 unit of analysis) nested within counties (the level–2 unit of analysis)."

Comment: Although this description would be fine for readers used to working with this type of statistical model, those who aren't conversant with those methods may be confused by terminology such as "level-1" and "unit of analysis."

Better: "The data have a hierarchical (or multilevel) structure, with families clustered within counties."

Comment: By replacing "nested" with the more familiar "clustered," identifying the specific concepts for the two levels of analysis, and mentioning that "hierarchical" and "multilevel" refer to the same type of analytic structure, this description relates the generic class of statistical model to this particular study.

Presenting results with charts

Charts are often the preferred way to convey numeric patterns, quickly revealing the relative sizes of groups, comparative levels of some outcome, or directions of trends (Tufte 2001; Nelson 2002; Briscoe 1996). As Beilenson puts it, "let your figures do the talking," reducing the need for long text descriptions or complex tables with lots of tiny numbers. For example, create a pie chart to present sample composition, use a simple bar chart to show how the dependent variable varies across subgroups, or use line charts or clustered bar charts to illustrate the net effects of non-linear specifications or interactions among independent variables (Miller 2005). Charts that include confidence intervals around point estimates are a quick and effective way to present effect size, direction, and statistical significance. For multivariate analyses, consider presenting only the results for the main variables of interest, listing the other variables in the model in a footnote and including complex statistical tables in a handout.

Provide each chart with a title (in large type) that explains the topic of that chart. A rhetorical question or summary of the main finding can be very effective. Accompany each chart with a few annotations that succinctly describe the patterns in that chart. Although each chart page should be self-explanatory, be judicious: Tufte (2001) cautions against encumbering your charts with too much "non-data ink" – excessive labeling or superfluous features such as arrows and labels on individual data points. Strive for a balance between guiding your readers through the findings and maintaining a clean, uncluttered poster. Use chart types that are familiar to your expected audience. Finally, remember that you can flesh out descriptions of charts and tables in your script rather than including all the details on the poster itself; see "Narrative to accompany a poster" below.

Describing numeric patterns and contrasts

As you describe patterns or numeric contrasts, whether from simple calculations or complex statistical models, explain both the direction and magnitude of the association. Incorporate the concepts under study and the units of measurement rather than simply reporting beta coefficients (β's) (Friedman 1990; Miller 2005).

Poor: "Number of enrolled children in the family is correlated with disenrollment."

Comment: Neither the direction nor the size of the association is apparent.

Poor [version #2]: "The log-hazard of disenrollment for one-child families was 0.316."

Comment: Most readers find it easier to assess the size and direction from hazards ratios (a form of relative risk) instead of log-hazards (log-relative risks, the β's from a hazards model).

Better: "Families with only one child enrolled in the program were about 1.4 times as likely as larger families to disenroll."

Comment: This version explains the association between number of children and disenrollment without requiring viewers to exponentiate the log-hazard in their heads to assess the size and direction of that association. It also explicitly identifies the group against which one-child families are compared in the model.

Presenting statistical test results

On your poster, use an approach to presenting statistical significance that keeps the focus on your results, not on the arithmetic needed to conduct inferential statistical tests. Replace standard errors or test statistics with confidence intervals, *p*-values, or symbols, or use formatting such as boldface, italics, or a contrasting color to denote statistically significant findings (Davis 1997; Miller 2005). Include the detailed statistical results in handouts for later perusal.

To illustrate these recommendations, Figures 1 and 2 demonstrate how to divide results from a complex, multilevel model across several poster pages, using charts and bullets in lieu of the detailed statistical table from the scientific paper (Table 1; Phillips et al. 2004). Following experts' advice to focus on one or two key points, these charts emphasize the findings from the final model (Model 5) rather than also discussing each of the fixed- and random-effects specifications from the paper.

Figure 1 uses a chart (also from the paper) to present the net effects of a complicated set of interactions between two family-level traits (race and SCHIP plan) and a cross-level interaction between race of the family and county physician racial composition. The title is a rhetorical question that identifies the issue addressed in the chart, and the annotations explain the pattern. The chart version substantially reduces the amount of time viewers need to understand the main take-home point, averting the need to mentally sum and exponentiate several coefficients from the table.

Table 1 about here

Figure 1 about here

Figure 2 uses bulleted text to summarize other key results from the model, translating log-relative hazards into hazards ratios and interpreting them with minimal reliance on jargon. The results for family race, SCHIP plan, and county physician racial composition are not repeated in Figure 2, averting the common problem of interpreting main effect coefficients and interaction coefficients without reference to one another.

Figure 2 about here

Alternatively, replace the text summary shown in Figure 2 with Table 2 - a simplified version of Table 1 which presents only the results for Model 5, replaces log-relative hazards with hazards ratios, reports associated confidence intervals in lieu of standard errors, and uses boldface to denote statistical significance. (On a color slide, use a contrasting color in lieu of bold.)

Table 2 about here

Contents and organization of a poster

Research posters are organized like scientific papers, with separate pages devoted to the objectives and background, data and methods, results, and conclusions (Briscoe 1996). Readers view the posters at their own pace and at close range; thus you can include more detail than in slides for a speech

(see Appendix A for a detailed comparison of content and format of papers, speeches, and posters). Don't simply post pages from the scientific paper, which are far too text-heavy for a poster. Adapt them, replacing long paragraphs and complex tables with bulleted text, charts, and simple tables (Beilenson 2004; Briscoe 1996). Fink (1995) provides useful guidelines for writing text bullets to convey research results. Use presentation software such as PowerPoint to create your pages or adapt them from related slides, facilitating good page layout with generous type size, bullets, and page titles. Such software also makes it easy to create matching handouts (see "Handouts" below).

The "W's" (who, what, when, where, why) are an effective way to organize the elements of a poster.

- In the introductory section, describe what you are studying, why it is important, and how your analysis will add to the existing literature in the field.
- In the data and methods section of a statistical analysis, list when, where, who, and how the data were collected, how many cases were involved, and how the data were analyzed. For other types of interventions or program evaluations, list who, when, where, and how many, along with how the project was implemented and assessed.
- In the results section, present what you found.
- In the conclusion, return to what you found and how it can be used to inform programs or policies related to the issue.

Number and layout of pages

To determine how many pages you have to work with, find out the dimensions of your assigned space. An 8' by 4' bulletin board accommodates the equivalent of about twenty 8.5" by 11" pages, but be selective – no poster can capture the full detail of a large series of multivariate models. A trifold presentation board (3' high by 4' wide) will hold roughly a dozen pages, organized into three panels (Appendix B). Breaking the arrangement into vertical sections allows viewers to read each section standing in one place while following the conventions of reading left-to-right and top-to-bottom (Briscoe 1996).

Figure 3 about here

- At the top of the poster, put an informative title in a large, readable type size. On a 4' by 8' bulletin board, there should also be room for an institutional logo.
- Except on small posters, include a one-page abstract or brief summary of your project (see "What We Learned" in Figure 3 and Appendix C). This will give prospective readers an overview of your work and help them decide whether to read the full poster, so take the time to write an accurate, enticing summary.
- In the left-hand panel, set the stage for the research question, conveying why the topic is of policy interest, summarizing major empirical or theoretical work on related topics, and stating your hypotheses or project aims, and explaining how your work fills in gaps in previous analyses.
- In the middle panel, briefly describe your data source, variables, and methods, then present results in tables or charts accompanied by text annotations. Diagrams, maps, and photographs are very effective for conveying issues difficult to capture succinctly in words (Miller, 2005), and to help readers envision the context. A schematic diagram of relationships among variables can be useful for illustrating causal order. Likewise, a diagram can be a succinct way to convey timing of different components of a longitudinal study or the nested structure of a multilevel data set.
- In the right-hand panel, summarize your findings and relate them back to the research question or project aims, discuss strengths and limitations of your approach, identify research, practice, or policy implications, and suggest directions for future research.

Figure 3 (adapted from Beilenson 2004) shows a suggested layout for a 4' by 8' bulletin board, designed to be created using software such as Pagemaker that generates a single-sheet presentation; Appendix C shows a complete poster version of the Phillips et al. (2004) multilevel analysis of SCHIP disenrollment. If hardware or budget constraints preclude making a single-sheet poster, a similar

configuration can be created using standard 8.5”x11” pages in place of the individual tables, charts, or blocks of text shown in Figure 3.

Find out well in advance how the posters are to be mounted so you can bring the appropriate supplies. If the room is set up for table-top presentations, tri-fold poster boards are essential because you won’t have anything to attach a flat poster board or pages to. If you have been assigned a bulletin board, bring push-pins or a staple gun.

Regardless of whether you will be mounting your poster at the conference or ahead of time, plan how the pages are to be arranged. Experiment with different page arrangements on a table marked with the dimensions of your overall poster. Once you have a final layout, number the backs of the pages or draw a rough sketch to work from as you arrange the pages on the board. If you must pin pages to a bulletin board at the conference venue, allow ample time to make them level and evenly-spaced.

Other design considerations

A few other issues to keep in mind as you design your poster. Write a short, specific title that fits in large type size on the title banner of your poster. The title will be potential readers’ first glimpse of your poster, so make it inviting and easy to read from a distance – at least 40-point, ideally larger. Beilenson (2004) advises embedding your key finding in the title so viewers don’t have to dig through the abstract or concluding page to understand the purpose and conclusions of your work. A caution: If you report a numeric finding in your title, keep in mind that readers may latch onto it as a “factoid” to summarize your conclusions, so select and phrase it carefully (McDonough 2000).

Use at least 14-point type for the body of the poster text. As Briscoe (1996) points out, “many in your audience have reached the bifocal age” and all of them will read your poster while standing, hence long paragraphs in small type will not be appreciated! Make judicious use of color. Use a clear, white, or pastel for the background, with black or another dark color for most text, and a bright, contrasting shade to emphasize key points or to identify statistically significant results (Davis 1997).

Narrative to accompany a poster

Prepare a brief oral synopsis of the purpose, findings, and implications of your work to say to interested parties as they pause to read your poster. Keep it short – a few sentences that highlight what you are studying, a couple of key findings, and why they are important. Design your overview as a “sound byte” that captures your main points in a succinct and compelling fashion (Beilenson 2004). After hearing your introduction, listeners will either nod and move along or comment on some aspect of your work that intrigues them. You can then tailor additional discussion to individual listeners, adjusting the focus and amount of detail to suit their interests. Gesture at the relevant pages as you make each point, stating the purpose of each chart or table and explaining its layout before describing the numeric findings; see (Miller 2005) for guidelines on how to explain tables and charts to a live audience. Briscoe (1996) points out that these mini-scripts are opportunities for you to fill in details of your story line, allowing you to keep the pages themselves simple and uncluttered.

Prepare short answers to likely questions about various aspects of your work, such as why it is important from a policy or research perspective, or descriptions of data, methods, and specific results. Think of these as little modules from an overall speech – concise descriptions of particular elements of your study that you can choose among in response to questions that arise. Beilenson (2004) also recommends developing a few questions to ask your viewers, inquiring about their reactions to your findings, ideas for additional questions, or names of others working on the topic.

Practice your poster presentation in front of a test audience acquainted with the interests and statistical proficiency of your expected viewers. Ideally, your critic should not be too familiar with your work: A fresh set of eyes and ears is more likely to identify potential points of confusion than someone who is jaded from working closely with the material while writing the paper or drafting the poster (Beilenson 2004). Ask your reviewer to identify elements that are unclear, flag jargon to be paraphrased or defined, and recommend changes to improve clarity (Miller 2005). Have them critique your oral presentation as well as the contents and layout of the poster.

Handouts

Prepare handouts to distribute to interested viewers. These can be produced from slides created in presentation software, printed several to a page along with a cover page containing the abstract and your contact information. Or package an executive summary or abstract with a few key tables or charts. Handouts provide access to the more detailed literature review, data and methods, full set of results, and citations without requiring viewers to read all of that information from the poster (Miller 2005; Beilenson 2004). Although you also can bring copies of the complete paper, it is easier on both you and your viewers if you collect business cards or addresses and mail the paper later.

Discussion

The quality and effectiveness of research posters at professional conferences is often compromised by authors' failure to take into account the unique nature of such presentations. One common error is posting numerous statistical tables and long paragraphs from a research paper – an approach that overwhelms viewers with too much detail for this type of format and presumes familiarity with advanced statistical techniques. Following recommendations from the literature on research communication and poster design, this paper shows how to focus each poster on a few key points, using charts and text bullets to convey results as part of a clear, straightforward story line, and supplementing with handouts and an oral overview.

Another frequent mistake is treating posters as a one-way means of communication. Unlike published papers, poster sessions are live presentations; unlike speeches, they allow for extended conversation with viewers. This note explains how to create an oral synopsis of the project, short modular descriptions of poster elements, and questions to encourage dialog. By following these guidelines, researchers can substantially improve their conference posters as vehicles to disseminate findings to varied research and policy audiences.

Checklist for preparing and presenting an effective research posters

<u>Content</u>

- Design poster to focus on two or three key points.
- Adapt materials to suit expected viewers' knowledge of your topic and methods.
  - Design questions to meet their interests and expected applications of your work.
  - Paraphrase descriptions of complex statistical methods.
  - Spell out acronyms if used.
- Replace large detailed tables with charts or small, simplified tables.
- Accompany tables or charts with bulleted annotations of major findings.
  - Describe direction and magnitude of associations.
- Use confidence intervals, *p*-values, symbols, or formatting to denote statistical significance.

<u>Layout and format</u>

- Organize the poster into background, data and methods, results, and study implications.
- Divide the material into vertical sections on the poster.
- Use at least 14-point type in the body of your poster, at least 40-point for the title.

<u>Narrative description</u>

- Rehearse a 3 to 4 sentence overview of your research objectives and main findings.
- Write short modular descriptions of specific elements of the poster to choose among in response to viewers' questions.
  - Background
  - Summary of key studies and gaps in existing literature
  - Data and methods
  - Each table, chart, or set of bulleted results
  - Research, policy, and practice implications
- Write a few questions to ask viewers.
  - Solicit their input on your findings

- Develop additional questions for later analysis
- Identify other researchers in the field

Handouts

- Prepare handouts to distribute to interested viewers.
  - Print slides from presentation software, several to a page.
  - Or package an executive summary or abstract with a few key tables or charts.
  - Include an abstract and contact information.

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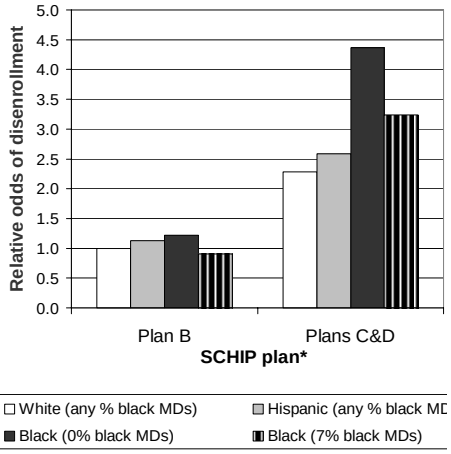
How do family race and county physician racial composition affect SCHIP disenrollment?



- For black families
  - excess risk of disenrollment much lower in counties with higher % black MDs than those with few black MDs.
- For white and Hispanic families
  - no difference in disenrollment patterns according to % of MDs in the county who are black.

* SCHIP plans: Plan B is for children in families with incomes 133% to 150% of the Federal Poverty Level (FPL). Plans C & D are for children in families with incomes 150% to 350% of the FPL.

Results are based on a multivariate model controlling for family age composition, # children, language, and county poverty rate. Highest share of black physicians in New Jersey counties in 1990 was 7%.

Figure 1. Presenting complex statistical results graphically

Effects of other family and county characteristics on SCHIP disenrollment

Family traits

- **Number of children enrolled**
  - Families with only one child enrolled in the program were 1.4 times as likely as larger families to disenroll (p<0.01).
- **Age composition of enrolled children**
  - Families with infants are only about 60% as likely to disenroll (p < 0.01).
  - Risk of disenrollment increases by 18% for each child aged 1-4 years (p<0.01).
  - Number of children above age 5 does not affect disenrollment.
- **Language**
  - Those who speak Spanish with some English are about 90% as likely to disenroll than those who speak English only (p<0.05).
  - There is no difference between people who speak only Spanish and those who speak only English.

County characteristics

- **Provider density**
  - An increase of one NJ KidCare provider per square mile is associated with a 1.9% decline in the chances of disenrollment (p < 0.01).
- **Population density.**
  - Disenrollment is lower in counties with higher population density.
  - However, physician density and population density are highly correlated (r=0.96, p<0.01), so they can't be included in the same model.
- **Birthplace, language, and ethnicity**
  - % foreign-born, % Spanish-speaking, % Hispanic, and % of county physicians who are Hispanic are statistically significant when they are the only county characteristic in the model.
  - However, they are highly correlated with population or physician density and are not statistically significant when either density measure is included.
- **Intercounty variation in disenrollment**
  - Once provider density is controlled, there is no longer any statistically significant variation between counties in disenrollment rates.

Based on models controlling for all traits mentioned here as well as family race, SCHIP plan level, and county physician racial composition and poverty rate.

Figure 2. Text summary of additional statistical results

Table 1. Multilevel discrete-time hazards models of disenrollment from SCHIP, New Jersey, January 1998–April 2000.

	Baseline Hazard (1)		Ignoring County of Residence (2)		County Fixed Effects Model (3)		Random Effects Model Family Factors Only (4)		Random Effects Model Family + County Factors (5)	
Variable	LRH[a]	s.e.	LRH	s.e.	LRH	s.e.	LRH	s.e.	LRH	s.e.
Intercept	-4.327	(.049)	-5.426	(.140)	-5.581	(.159)	-5.421	(.142)	-5.455	(.159)
Family-Level Characteristics										
Months Enrolled	0.072	(.012)	0.018	(.034)	0.018	(.034)	0.018	(.034)	0.018	(.034)
Months Enrolled-squared	-0.0008	(.0007)	0.0046	(.002)	0.0046	(.002)	0.0046	(.002)	0.0046	(.002)
Black Race			0.016	(.149)	0.047	(.150)	0.038	(.149)	0.198	(.165)
Hispanic Race			0.091	(.062)	0.121	(.064)	0.109	(.063)	0.124	(.064)
Plans C and D (ref = Plan B)			0.819	(.142)	0.826	(.142)	0.823	(.142)	0.825	(.142)
One Enrolled Child			0.313	(.038)	0.317	(.038)	0.316	(.037)	0.316	(.038)
# Infants			-0.555	(.168)	-0.562	(.168)	-0.555	(.168)	-0.550	(.168)
# 1-4 Year Olds			0.174	(.028)	0.165	(.028)	0.167	(.028)	0.166	(.028)
Spanish with some English			-0.152	(.068)	-0.136	(.069)	-0.144	(.069)	-0.139	(.069)
Spanish with no English			0.015	(.146)	0.0092	(.146)	0.0084	(.146)	0.013	(.146)
Interactions										
Black * Plans C/D			0.461	(.154)	0.449	(.154)	0.456	(.154)	0.451	(.154)
Plans C/D * Months			0.078	(.036)	0.078	(.036)	0.078	(.036)	0.077	(.036)
Plans C/D * (Months Squared)			-0.0069	(.0019)	-0.0069	(.0019)	-0.0069	(.0019)	-0.0068	(.0019)
County-Level Characteristics										
KidCare Provider Density									-0.019	(.007)
% Poor									0.0054	(.005)
% Black Physicians									.007	(.012)
Cross-Level Interaction										
Black * % Black Physicians									-0.039	(.019)
Random Effects										
Between-County Variance	0.016	(.009)					0.012	(.007)	0.005	(0.006)
Scaled Deviance Statistic	31,432.4		30,877.6		30,824.5		30,948.4		30,895.4	

Source: Phillips et al. 2004.

[a] LRH = log relative-hazard.

Table 2. Relative risks of SCHIP disenrollment for other* family and county characteristics, New Jersey, January 1998–April 2000.

	Relative risk (95% CI)
Family-Level Characteristics	
One Enrolled Child (ref. = 2+ children)	**1.37 (1.27-1.48)**
Ages of children (ref. = # 5-17 yr. olds)	
# Infants	**0.58 (0.42-0.80)**
# 1-4 yr. olds	**1.18 (1.12-1.25)**
Language spoken at home (ref. = English)	
Spanish with some English	0.87 (0.76-1.00)
Spanish with no English	1.01 (0.76-1.35
County-Level Characteristics	
KidCare Provider Density (providers/mile^2)	**0.98 (0.97-0.99)**
% Poor	**1.01 (1.00-1.02)**

* Other than race, plan and physician county racial composition, which are shown in Figure 1.

95% CI = 95% confidence interval

Statistically significant associations are shown in **bold.**

Based on hierarchical linear model controlling for months enrolled, months-squared, race, SCHIP plan, county physician racial composition, and all variables shown here. Scaled deviance = 30,895. Random effects estimate for between-county variance = 0.005 (standard error = 0.006)

Appendix A.1 Comparison of research papers, presentations, and posters – materials and audience interaction

	Research paper[a]	20-minute oral conference presentation	4' by 8' poster presentation
Written materials			
Form	Printed document (paper or web).	Slides or overhead transparencies	Poster pages
Length	• 12-16 pages (research brief) • 20-25 pages (full length article)	Average of 1 slide/minute • Less time for text slides • More time for table/chart slides	• 12 pages (tri-fold presentation board) • 15-20 pages (4' by 8' bulletin board)
Style	Full sentences and paragraphs; formal essay structure.	• Bulleted phrases replace full sentences (see Fink 1995) • Charts and tables simplified from research paper version	• Full paragraphs in abstract. • Bulleted sentences in introduction and conclusion • Bulleted phrases replace full sentences in data & methods & results • Charts and tables simplified from research paper version
Type size	12-point	• Slides titles: 24 point or larger • Text: 18 point or larger	• Poster title: 40 point or larger • Page titles: 20 point or larger • Text: 14-16 point
Color	Black type on white background	Dark background with light main text OR clear/pale background with dark text. Contrasting color for emphasis (e.g., statistical significance)	Clear or pale colored background Dark color for most text. Contrasting color for emphasis (e.g., statistical significance)
Other formatting	Use subheadings to guide readers within sections (e.g., naming subtopics within the introduction, literature review, or results).	Use slide titles to guide viewers, integrating specific topic, purpose, or finding of each slide.	Use page titles to guide viewers, integrating specific topic, purpose, or finding of each page.

[a] Following *Health Services Research* guidelines for authors.

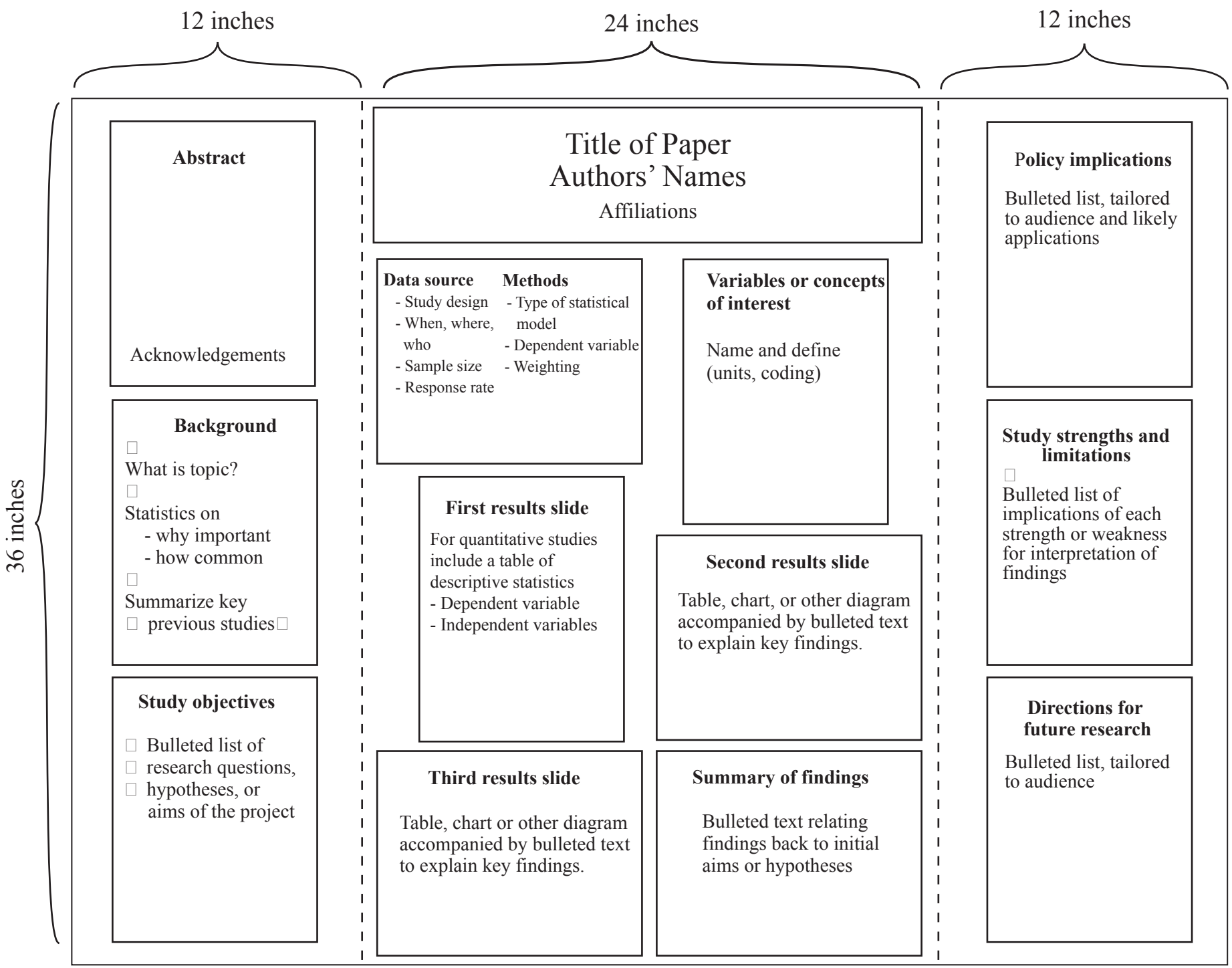
Appendix A, continued	Research paper	20-minute oral conference presentation	4' by 8' poster presentation
Spoken materials	Not applicable	Speaker's notes: Either full narrative script or selected reminders, coordinated with slides. See Miller (2005), chapter 15.	Few sentences summarizing main objectives and findings, spoken to each viewer. Brief modules about each major section of the poster,[b] to be chosen from in response to questions from individual viewers. Few questions to ask viewers to solicit reactions to your findings, ideas for additional questions, or names of others working on the topic.
Handouts	Not applicable	Handout of slides, copied several to a page.[c] Abstract and detailed tables may be distributed for longer seminars.	Abstract + handout of slides, copied several to a page. OR copy of the complete research paper.
Interaction with audience	Occasional email, phone, or in-person queries.	Questions and discussion from the audience. • Usually quite limited in a multi-paper conference session. • Can be extensive during a longer individual seminar. Questions from individual audience members after the session, where responses can be tailored to each person.	One-on-one discussion with viewers, tailored in response to questions and responses from each viewer; see "spoken materials" above. Potentially extensive, depending on interests of viewers.

[b] Create separate 1-2 minute modules for: background, literature review, data and methods, results, conclusions, research implications & policy implications.
[c] Presentation software (e.g., PowerPoint) can automatically format such handouts.

Appendix A.2 Comparison of research papers, presentations, and posters – contents

	Research paper	20-minute oral conference presentation[a, b]	4' by 8' poster presentation
Abstract	Yes	No	Yes
Introduction	Several pages of background on issue and its importance, ending with statement of research question or hypotheses.	1-2 slides of background on issue and its importance. One slide stating research question or hypotheses.	1-2 pages of background on issue and its importance, ending with statement of research question or hypotheses.
Literature review	Detailed review and summary of previous studies on similar topics and methods.	1-2 slides of few key studies only, either as tabular summary or bulleted text. More detail possible for longer seminars.	1 page, focusing on main points from few key articles and identifying gaps in the literature.
Data and methods	Comprehensive, detailed information on data sources, study design, variables, and statistical methods. May include equations.	3-4 slides presenting only essential information on data sources, study design, variables, and statistical methods.	2-3 pages presenting essential information on data sources, study design, variables, and statistical methods.
Results	Detailed statistical tables and charts accompanied by prose descriptions written in paragraph form.	4-5 slides with simplified tables and charts, either accompanied by bulleted text annotations or described in speaker's notes. One major result or set of related results per slide – reflected in slide title.	4-5 pages of simplified tables and charts accompanied by bulleted text annotations. One major result or set of related results per page – reflected in page title.
Conclusions	Several pages relating findings to research question and to related studies, discussing study strengths and limitations, and describing research and policy implications.	One slide each of bulleted text on • Summary of key findings • Policy implications • Directions for future research • Strengths and limitations	2-3 pages summarizing key findings, discussing study strengths and limitations, and describing implications for research, policy, and practice.

[a] Assumes a professional research audience such as persons attending the *AcademyHealth* Annual Research Conference. For lay audiences, reduce emphasis on data, methods, statistical results, and research implications; increase emphasis on purpose, findings, and policy implications. See Miller (2005), chapter 16.
[b] For a longer presentation or seminar, increase sections proportionately.



Appendix B. Suggested layout for a tri–fold presentation board

Rutgers Center for State Health Policy
The Institute for Health, Health Care Policy and Aging Research

Context or Composition?
What Explains Variation in SCHIP disenrollment?

Julie Phillips, Jane Miller, Joel Cantor, and Dorothy Gaboda
Rutgers University

Mailing address
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WHAT WE LEARNED

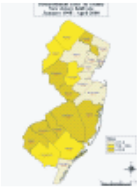
The State Children's Health Insurance Program (SCHIP) is intended to provide health insurance to children in low income families. Our multilevel analysis of data for New Jersey's SCHIP found that families enrolled in plans involving cost-sharing, blacks, and those with only one enrolled child had higher disenrollment rates, although the excess disenrollment for blacks was lower in counties with a high share of black physicians. These characteristics account for part of the inter-county variation in disenrollment rates; remaining inter-county variation is largely explained by physician density or population density.

BACKGROUND

SCHIP = State Children's Health Insurance Program
- Purpose: Expand health insurance to uninsured low-income children in the U.S.
  - ~ 11 million uninsured in late 1990s.
- Federally funded insurance initiative under the Balanced Budget Act of 1997.
  - States have discretion about plan design:
    - Whether to extend benefits above 100% of Federal Poverty Level (FPL).
    - Cost-sharing for moderate income families.
- New Jersey's SCHIP program = NJ KidCare; became NJ FamilyCare in 2000.
- Uninsured children are less likely to receive comprehensive, preventive medical care, so it is important to identify factors to reduce disenrollment from SCHIP.

OBJECTIVES

- To investigate the relative contributions of family and county characteristics to observed variation in disenrollment from NJ KidCare.
- To assess whether county characteristics account for observed substantial inter-county disenrollment.
  - Disentangle two possible reasons for geographic variation in health outcomes (Duncan et al., 1998)
    - 'Contextual' effects.
      - e.g. physician density can affect access to care for all families in the geographic area.
    - 'Compositional' effects.
      - e.g., the types of people who are more likely to disenroll might be clustered in certain areas.



DATA AND METHODS

Data are from all families enrolled in NJ KidCare from 1998-2000.
We estimate a multilevel discrete-time hazards model (AKA hierarchical linear model; HLM), with families clustered in counties.
- Level 1 = family (N = 24,628).
  - Data from NJ KidCare administrative records
- Level 2 = county (N=21).
  - Data from Census, NJ Division of Insurance, Area Resource File, and NJ FamilyCare provider roster.

Chances of disenrollment from SCHIP vary by amount of time enrolled, so we used hazards models (also known as event history analysis or survival analysis) to correct for those differences when estimating disenrollment patterns for SCHIP plans for different income levels.

	Terms of NJ KidCare plans			
Plan	Income eligibility	Effective date	Monthly premium	Co-payments
A[1]	Up to 185% of FPL[2] for infants; 100% to 133% of FPL for ages 1-17	2/1/1998 Retroactive eligibility possible	None	None
B	133% to 150% of FPL for ages 1-17	3/1/1998	None	None
C	185% to 200% of FPL for infants; 150% to 200% of FPL for ages 1-17	3/1/1998	$15/family	For some services
D	200% to 350% of FPL for ages 0-17	7/1/1999	Sliding scale: $30 to $100/family	For some services

1 Plan A (Medicaid expansion) data not available.
2 FPL = Federal poverty level. FPL varies by family size and age composition.

VARIABLES

Distribution of enrolled families and disenrollment rates by demographic characteristics

	# families	%	Monthly disenrollment rate
All children	24,628	100%	1.9%
Race			
Non-Hispanic white	9,455	38%	1.7%
Non-Hispanic black	4,707	19%	2.6%
Hispanic	6,921	28%	1.7%
Other	2,344	10%	1.7%
Language			
English	11,505	47%	2.0%
Spanish, some Engl.	4,855	20%	1.7%
Spanish, no Engl.	550	2%	1.7%
Other language	1,797	7%	1.2%
Age group			
<1 year	458	2%	1.1%
1 - 5 years	11,248	46%	2.0%
6 - 12 years	13,554	55%	1.7%
13 -17 years	7,481	30%	1.5%
# children on account			
One	12,448	51%	2.2%
Two	8,633	35%	1.6%
Three	2,815	11%	1.7%
Four or more	731	3%	1.5%
Gender			
Male	16,095	65%	1.8%
Female	15,548	63%	1.8%

County-level variables
- Programmatic:
  - KidCare physician density.
  - Enrolled kids per physician.
  - Program uptake.
- Unemployment and occupational comp.
  - Unemployment rate.
  - % small firms.
  - Service and retail.
- Demographic:
  - Population density.
  - Racial composition.
  - Residential segregation.
- Socioeconomic:
  - Poverty rate.
  - Income distribution.
- Health care
  - % of physicians who are black
  - % of physicians who are Hispanic

FAMILY-LEVEL RESULTS

- Number of children enrolled
  - Families with only one child enrolled in the program were 1.37 times as likely as larger families to disenroll.
- Age composition of enrolled children
  - Families with infants are only about 60% as likely to disenroll.
  - Risk of disenrollment increases by 18% for each child aged 1-4 years.
  - Number of children above age 5 doesn't affect disenrollment.
- Language
  - Those who speak Spanish with some English are about 90% as likely to disenroll as those who speak only English.
  - There is no difference between people who speak only Spanish and those who speak only English.

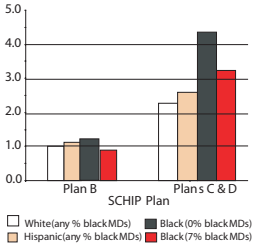
STUDY STRENGTHS AND LIMITATIONS

Study strengths
- Prospective data - more accurate date recall than retrospective survey data.
- Large # of cases
  - Support multivariate analysis.
    - Previous studies don't provide disenrollment estimates for subgroups.
  - Support multilevel modeling.
    - Wide range of socioeconomic and demographic county attributes

Limitations
- Drawbacks of administrative data
  - Reasons for disenrollment crudely measured; some dropouts obtain other insurance.
- Some county characteristics not measured well
  - Physician racial composition also outdated (1990).
  - Income inequality, residential segregation are outdated (1990) and measured by metropolitan area (MSA) not county.

RESULTS

How do family race, SCHIP plan, and county physician racial composition affect SCHIP disenrollment?



Based on a multivariate model controlling for family age composition, # children, language, and county poverty rate.
Results shown in red text: p<.05 in the multivariate specification.

- Regardless of race, families in Plan B had lower disenrollment than those in Plans C or D.
- For blacks, excess risk of disenrollment much lower in counties with higher % black MDs.
- For other racial/ethnic groups, no difference in disenrollment patterns according to physician racial composition (%black, % Hispanic, or % white MDs).

County characteristics and disenrollment
- Provider density
  - An increase of one NJ KidCare provider per square mile is associated with a 1.9% decline in the chances of disenrollment.
- Population density.
  - Disenrollment is lower in counties with higher population density.
  - However, physician density and population density are highly correlated (r=0.96; p<.01), so they can't be included in the same model.
- Birthplace, language, and ethnicity
  - % foreign-born, % Spanish-speaking, % Hispanic, and % of county physicians who are Hispanic are statistically significant when they are the only county characteristic in the model.
  - However, they are highly correlated with population or physician density and are not statistically significant when either density measure is included.

Summary of findings re: context and composition
- Once provider density is controlled, inter-county variation in SCHIP disenrollment is borderline significant (p=.056), thus specific county traits appear to explain much of that variation.
- Family traits remain statistically significant even when county characteristics are taken into account, therefore little of the observed relationship between family-level traits and SCHIP disenrollment is due to county clustering.

STUDY IMPLICATIONS

States' efforts to improve retention might consider:
- Targeting:
  - Black families.
  - High disenrollment counties.
- Evaluate role of racial/cultural match between clients and health care providers.
- Cost-sharing appears to discourage retention.
  - Consider emergency premium waivers.
- But families in cost-sharing plans
  - Have higher incomes
  - Are more likely to have access to other types of health insurance.

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