

WHERE WE ARE AND WHERE WE NEED TO GO: DNP AND PHD NURSE PRACTITIONER FACULTY RESEARCH

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Overview of Presentation

- To understand the current state of nurse practitioner faculty research, a web-based NONPF Research SIG Survey was conducted
- In this presentation, the survey results will be presented
- There was expected variance among NONPF members regarding quantitative and qualitative methodologies
- Quantitative methods were primarily descriptive and exploratory



Overview of Presentation

- To study complex health determinants needed for health promotion and disease prevention research, advanced research methods are needed
- Complex research designs require significant time, thought and expertise
 - A statistician will demonstrate the importance of understanding effect sizes



Overview of Presentation



- Only a small number of nurse practitioner faculty used research designs that examined the complex interplay of biological, psychosocial, and environmental factors
- A nurse practitioner faculty member will discuss the use of geographic information systems in understanding complex factors that affect patient's healthcare on a daily basis

RESULTS OF THE 2012 NONPF RESEARCH SIG SURVEY AND IMPLICATIONS FOR FUTURE RESEARCH

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The 2012 NONPF Research SIG Survey

- Nurse practitioner faculty researchers have close proximity to:
 - Academic institutions
 - Patient Care
 - Multiple populations
 - Multiple health related conditions
- NONPF Research SIG Members developed Research SIG Survey

Methods

- Design and Sample
 - Descriptive Survey utilized a web-based survey
 - NONPF membership
- Measure
 - Research defined as *the discovery of knowledge that is or can be applied to real life health care settings*
 - 23-questions (open and close-ended) survey
 - Demographic
 - Academic
 - Research-related questions

Methods

- If members had conducted research within last ten years, asked about participation in:
 - Quantitative research
 - Qualitative research
 - Clinical Outcome research
 - Other types of research

Methods

- Survey also asked about:
 - Funding sources
 - Publications
 - Areas of research interests
 - Role in research
 - Grant review participation
 - Research Advisory Board participation
- Separate section (not identified with above questions)
 - Experience with conducting educational research & willingness to assist NONPF with this type of research
 - Nationally funded researcher available to provide brief consultations for other NONPF members

Procedures

- Approved by the NONPF BOARD and the IRB at Rush University
- Survey placed into Survey Monkey by NONPF Board
- Three e-mails sent to NONPF members (1,575 potential subjects) over a 10-week period of time (December, 2012 to February, 2013)
- Data prepared and analyzed by two NP researchers, a statistician, and assisted by a graduate student

Results

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- 348 NONPF members responded (22% response rate)
- Of those that responded, 85.2% had conducted research in the last 10 years
- Predominantly female (95.8%)

| | | Total |
|---------------|-----------------|-------|
| Degree | Master's Degree | 15.8% |
| | DNP or DrNP | 22.2% |
| | PhD or DNS/DNSC | 61.9% |

Results

| | | Total | Research (P=.041) |
|------------|--------|-----------------|-------------------|
| Age | <30-39 | 5.8% (19/328) | 63.2% (12/19) |
| | 40-49 | 19.2% (63/328) | 87.3% (55/63) |
| | 50-59 | 43.0% (141/328) | 86.5% (122/141) |
| | 60-69 | 30.2% (99/328) | 87.8% (86/98) |
| | >69 | 1.8% (6/328) | 66.7% (4/6) |

Results

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| | Respondents to Survey | Total |
|------------------|--------------------------------|-----------------|
| Specialty | Adult Acute Care | 2.8% (9/328) |
| | Adult Primary Care | 12.3% (40/328) |
| | Adult-Gerontology Acute Care | 2.8% (9/328) |
| | Adult-Gerontology Primary Care | 3.4% (11/328) |
| | Family /Across the Lifespan | 52.8% (172/328) |
| | Gerontological | 2.8% (9/328) |
| | Neonatal | 2.1% (7/328) |
| | Pediatric Acute Care | 1.5% (5/328) |
| | Pediatric Primary Care | 8.9% (29/328) |
| | Psychiatric-Mental Health | 5.8% (19/328) |
| | Women's Health/Gender-Specific | 4.9% (16/328) |

Type of Qualitative Research (In Past 10 Years)

| | |
|------------------------------------|-------|
| Focus Group | 30.8% |
| Phenomenology | 19.6% |
| Narrative Inquiry | 15.6% |
| Participatory Action Research | 11.6% |
| Grounded Theory | 10.5% |
| Ethnography | 6.9% |
| Other | 5.8% |
| Have not done Qualitative Research | 35.1% |

Type of Quantitative Research (In Past 10 Years)

| | |
|-------------------------------------|-------|
| Descriptive/Exploratory | 74.3% |
| Quasi-experimental | 25.0% |
| Secondary Data Analysis | 21.8% |
| Experimental | 11.3% |
| Cohort/Case Control | 9.2% |
| Pre-experimental | 4.9% |
| Other | 3.9% |
| Have not done Quantitative Research | 9.5% |

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| Type of Clinical Outcomes Research (In Past 10 Years) | | | | | | | | | | | | | | | |
|--|---|---------------------|-------|---------------------|-------|------------------|-------|--------------------|------|------------------------------------|------|-------|------|--|-------|
| 16 | <table border="1"> <tr> <td>Patient Health Care</td> <td>31.5%</td> </tr> <tr> <td>Quality Improvement</td> <td>24.0%</td> </tr> <tr> <td>Population Based</td> <td>20.4%</td> </tr> <tr> <td>Systems Management</td> <td>6.5%</td> </tr> <tr> <td>Comparative Effectiveness Research</td> <td>4.3%</td> </tr> <tr> <td>Other</td> <td>3.2%</td> </tr> <tr> <td>Have not done Clinical Outcomes Research</td> <td>38.0%</td> </tr> </table> | Patient Health Care | 31.5% | Quality Improvement | 24.0% | Population Based | 20.4% | Systems Management | 6.5% | Comparative Effectiveness Research | 4.3% | Other | 3.2% | Have not done Clinical Outcomes Research | 38.0% |
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| Other Types of Research (In Past 10 Years) | | | | | | | | | |
|---|--|-------------------|-------|---------------|------|------------------------------------|-------|--------------------------|-------|
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| Not Doing Other Research | 64.6% | | | | | | | | |

| Results | |
|----------------|---|
| | <ul style="list-style-type: none"> <input type="checkbox"/> Funding (62.1%) <ul style="list-style-type: none"> <input type="checkbox"/> Intramural – 46.5% <input type="checkbox"/> NIH – 35.4% <input type="checkbox"/> Sigma Theta Tau – 34.4% <input type="checkbox"/> Amount of funding <ul style="list-style-type: none"> <input type="checkbox"/> < \$10,000 = 32% <input type="checkbox"/> >\$1,000,000 = 11.4% <input type="checkbox"/> Publications (65.2%) <ul style="list-style-type: none"> <input type="checkbox"/> Nursing peer-reviewed journals (85.4%) |

Results

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- Age
 - Number of qualitative methods used steadily increases from the 30-39 y/o group to the 60-69 y/o group
 - The 40-49 y/o group, 50-59 y/o group and 60-69 y/o group tended to use more quantitative methods,
 - However no significant results were found with age groups except with phenomenology
- Specialty
 - No specific trend was seen between the specialty and the actual number of different types of qualitative or quantitative methods that were used
 - No significant results were found in regards to specialty and research type except for Comparative Effectiveness Research
- Academic Degree
 - Significant results found in regards to type of highest academic degree the participant reported

Results

- Research Interests
 - Research interests broad and representative of full spectrum of NONPF faculty interests
 - Nursing education and educational research interest high
- Roles - Largest percentage of NONPF researchers participated as PIs
- Regional/National Grant Reviews = 28.5%
- Research Advisory Board participation = 16.5%

Recommendations

- Impressive research capability among the NONPF membership
- Part of NIH funded group is approaching retirement age, experienced NONPF researchers can encourage and facilitate younger NP faculty research
- Experienced qualitative researchers – can meet need for growing interest in mixed-methods research
- Promotion of education/programs needed to conduct rigorous research that will improve population outcomes
- Growing intraprofessional (DNP and PhD) collaboration and interprofessional collaboration has significant potential to contribute to improvement of population outcomes
- More sophisticated advanced quantitative methods are warranted to study related phenomena

ENHANCING NURSE PRACTITIONER RESEARCH THROUGH BETTER DERIVED EFFECT SIZES

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Effect Sizes

- The basis for this lecture really emanates from a 1999 article by Leland Wilkinson, a statistical thinker who is an Adjunct Professor of Computer Science at University of Illinois at Chicago.
- Wilkinson's comments are as accurate now as they were in 1999.



Wilkinson, 1999, Page 10

Effect sizes

Always present effect sizes for primary outcomes. If the units of measurement are practically meaningful (e.g., number of cigarettes smoked per day), then we should usually prefer an unstandardized measure (regression coefficient or mean difference) to a standardized measure (r or d). It helps to add brief comments that place these effect sizes in a practical and theoretical context.

What has occurred since 1999?

- To be fair, standardized effect sizes (the kind Wilkinson told us not to report) are, I suspect, reported more frequently now than they were in 1999.
- But what, exactly, are we supposed to report?

Cohen's 'd'

- The most commonly reported effect size is Cohen's 'd'. This was discussed in detail in Cohen's 1988 book, *Statistical Power Analysis for the Behavioral Sciences*.
- Cohen defined 'd' as $(m_B - m_A) / \sigma$, where the 'alternative hypothesis' specifies the mean and σ is the 'common within-population standard deviation'.

Cohen's 'd' continued

- But what does this, in fact, mean?
- The alternative hypothesis, I suspect, means that we are controlling some intervention to a control group. Thus, 'd' represents the effect size I might expect to obtain if I were replicating this experiment.
- But is this really what Wilkinson was talking about when he discussed effect sizes?

Effect sizes

- I don't think so, otherwise, why would he care so much about the differences between standardized and unstandardized effects.
- Instead, what I believe Wilkinson is discussing here is the underlying effectiveness of an intervention, independent of a control condition.
- So, this is what we would expect to find if we were to apply the intervention to a real world setting.

Within-group and Between-group effects

- So, there are, in effect, two major flavors of effect sizes that we can look at in evaluating our interventions—the between-group effect, that compares it to a control condition, and a within-group effect that compares it to what the participants were like before the intervention.
- The first is helpful in planning a future experiment and estimating how many subject we will need in order to obtain adequate power.

Within-group and between-group designs.

- And the second is useful in predicting what sort of improvements we might see if we were to apply the intervention to another sample of participants.
- In general, the within-group effects will be larger than the between-group effects because the between-group effects remove any placebo effects.

But wait...

- In addition, how do we define our means and standard deviations?
- Is the mean a simple mean from a single point in time? Or is it the mean difference between scores at two points in time?
- And if we are looking at the difference between two means, should we be correcting for the correlations between the two sets of data for the purposes of estimating the standard deviation.

Focused versus general effects

- Another issue that Rosnow et al (2000) brings up is the difference between focused effects (based on one outcome effect) and general effects (for instance, the η^2 , that is used to estimate effects in the analysis of variance).
- This is a similar issue to the one we discussed when comparing within and between subject effects.

So, what do we report?

- It depends on the question you are trying to address.
- But whatever you report, be sure to report specifically how the effect size was estimated and why you chose to report that effect.

New uses for effect sizes

- First of all, effect sizes can be used to calibrate the effectiveness of interventions we are designing.
- So, for instance, when one conducts OT research, very often the impact of the OT interventions tends to be rather broad, and influences many domains of a person's life.

Functioning

| Item number and label | d |
|--------------------------------------|-----------------|
| CCAP_cd-Walk a block | 0.31 |
| CCAP_cd-Bath or shower | 0.26 |
| CCAP_cd-Walk in the house | 0.25 |
| CCAP_cd-Get in and out of house | 0.25 |
| CCAP_cd-Get in and out of car | 0.24 |
| CCAP_cd-Get on/off toilet | 0.14 |
| CCAP_cd-Prepare your own meals | 0.11 |
| CCAP_cd-Independent grocery shopping | 0.10 |
| CCAP_cd-Leisure and social acts | 0.09 |
| CCAP_cd-Do housework | 0.08 |
| CCAP_cd-Light hygiene | 0.06 |
| CCAP_cd-Move in and out of bed | 0.04 |
| CCAP_cd-Dress upper body | 0.04 |
| CCAP_cd-Self-feed | 0.02 |
| CCAP_cd-Move in and out of chair | 0.02 |
| CCAP_cd-Climb a flight of stairs | -0.01 |
| CCAP_cd-Dress lower body | -0.02 |
| CCAP_cd-Take meds | -0.05 |
| Mean (SD) | .11(.11) |

Focusing an Intervention

- As can be seen from the previous slide, most of our effects were in the areas of mobility and hygiene.
- They did little to improve other areas of functioning such as the ability to dress one's self.
- This can be seen as either a strength or weakness of the study, depending on what one values.

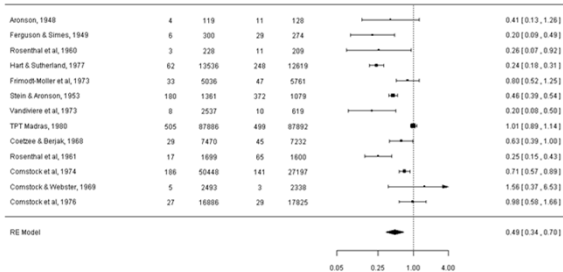
Bang for the Buck

- The second thing that the previous table is useful for is informing a decision-maker what they get for their money.
- So, in this case, you get improvements in mobility and hygiene.
- Based on this study, the Swedish government decided to implement this intervention without further testing, partially because it was so cost effective.

Using effect sizes

- While the use of effect sizes is complex, and still in its infancy, it is a very powerful method of analyzing results, especially when your sample size is small, or when you want to make real world decisions about the usefulness of a treatment.
- Now let's look at a popular use for effect sizes—meta-analysis.

Forest Plot



Effect Sizes

- They are more useful for making clinical decisions than p-values are—the magnitude of effect is more important to patient outcome than the likelihood that the effect is random
- They are underused and misunderstood statistics that deserve more use in the literature
- And nursing is an ideal field to use them

References

- Cohen J (1988) *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hedges L & Olkin I (1985) *Statistical Methods for Meta-analysis*. New York: Academic Press.
- Rosenthal R, Rosnow RL & Rubin DB (2000) *Contrasts and Effect Sizes in Behavioral Research: A Correlational Approach*. Google books.
- Wilkinson L (1999) *Statistical Methods in Psychology Journals Guidelines and Explanations*. Washington, DC: APA.

DISPLAYING DATA GEOGRAPHICALLY TO UNDERSTAND THE POPULATION

GEOGRAPHIC INFORMATION SYSTEMS (GIS)



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A Research Problem

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- How do we capture the complex biological, behavioral and social environmental exposures on individual and population health outcomes?

- How can researchers rigorously analyze 'macro-level' (environmental) factors with 'micro-level' (individual) factors?

Important Analytical tools

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1. **GIS:** allows exploration of spatial relationships of variables under study in the geographical area in which they are studied
 - Examples:
 - Are you examining air-borne pollution in the US vs. China?
 - Are you interested in variation in prevalence of disabling strokes within city neighborhoods for planning and allocation of intensive, costly health services?
 - Is there access to emergency medical services in rural communities to avoid 'failed to rescue' health outcomes?
 - NP Health Promotion Interventions need to be TAILORED to the environments where our clients live

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Background from my program of research
Racial Disparities in Birth Outcomes

NEIGHBORHOODS AND HEALTH:
WHAT DO WE NEED TO KNOW?

- Can we eliminate racial/ethnic health disparities?
- Can we decrease observed racial/ethnic health disparities?

Social Inequalities = Health Inequities

| | |
|--|--|
| | |
|--|--|

Where you live matters

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Stressed Environments



Adverse Health Outcomes



Poverty & Marginalized Minority

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These thematic maps were created using GIS. Data were imported allowing visualization of spatial patterns of variables (poverty and race) in Philadelphia.

Do see any patterns with the previous maps?

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❖ Each dot represents 40 premature births (PTB) during 2005

Red dot = 40 White babies
Black dot = 40 Black babies

❖ Are the patterns of PTB in 2005 indicative of other years?

Subsequent analysis merges 3 years > 61,000 births



What is GIS?


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- **Geographic Information System software***
Multidisciplinary software system designed to engage geographers, computer scientists, social scientists, planners, engineers and others.
- **System for input, storage, processing and retrieval of SPATIAL DATA**
 - Information about locations and shapes of geographic features
 - Graphic maps: use points, lines and polygons

*There are different proprietary GIS software: All these maps were created with ArcGIS 9.3

Standard Geographical Units based on CENSUS Bureau

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Philadelphia Geographical Boundaries
Census Tracts nested within Traditional Philadelphia Neighborhoods

Legend:
 - Census tract boundaries
 - Neighborhood boundaries
 - City limits

- Aggregated data available organized by varying units
 - Small: block group
 - Medium: census tract
 - Large: county

Cartography (study of map making): Shape files are locations in Earth coordinates representing, longitude, latitude, and elevation.

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Arc Hydro data model

- Streams
- Hydrographic points
- Drainage areas
- Hydrography
- Channels
- Surface terrain
- Runoff response

Land parcel data model

- Administrative areas
- Site addresses, regulated uses, restrictions
- Separated rights and encumbrances
- Ownership and tax parcels
- Parcel framework
- Census and boundaries
- Survey network

Layer: Digital orthophotography and hydrography
 Map use: Map background and reference
 Data source: Aerial photogrammetry and satellite collection

GIS Shape Files: Cartography

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□ Spatial representation

- The edges of a polyline or polygon are composed of points.
 - Database layers linked to these location identifiers

US Census Data: Hierarchical relationships between geographic types

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The screenshot shows a webpage with a hierarchical diagram of US Census geographic units. The diagram starts with 'BLOCKS' at the bottom, moving up through 'TRACTS', 'COUNTIES', 'STATES', and 'NATION'. Text on the page explains that blocks are the smallest unit, and that social epidemiologists generally agree that the census tract is the appropriate unit of analysis to capture 'neighborhood effect'.

1. The smallest unit census data are reported are in **blocks**.
2. This unit is aggregated up to larger units (**block groups, census tracts, county, state, etc**)
3. **Social epidemiologists** generally agree **census tract** is appropriate unit of analysis to capture 'neighborhood effect.'

Public Access to Census Data

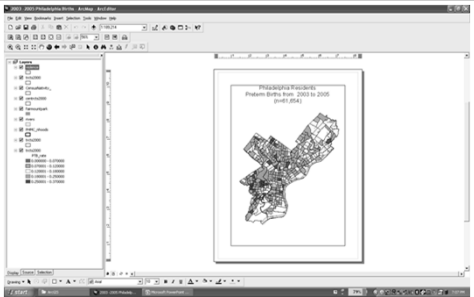
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The screenshot shows the American FactFinder interface with a list of data products. Text on the page indicates that data is downloaded into EXCEL files and provides the URL <http://factfinder.census.gov/>. It also notes that the Excel file (after formatting the first row) can be imported into GIS.

American FactFinder also has shape files that can be downloaded for all geographical units in the US
 (GIS technical assistance needed: to make sure they are projected to correct geography - polygon)

GIS Map With Multiple Layers of Data [in a shape file]

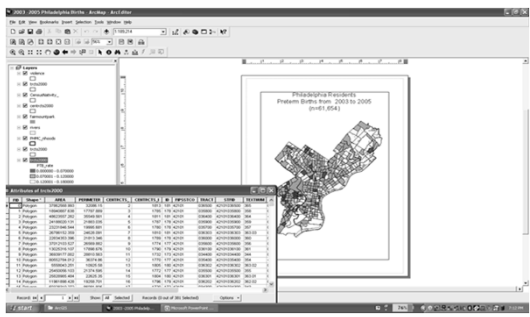
55



Data must be GEOCODED – aggregated to the geographical unit of analysis

Each geographical area (Census tract) has latitude and longitudinal points. Can access aggregated & de-identified data to merge with the shape file with unique identifier

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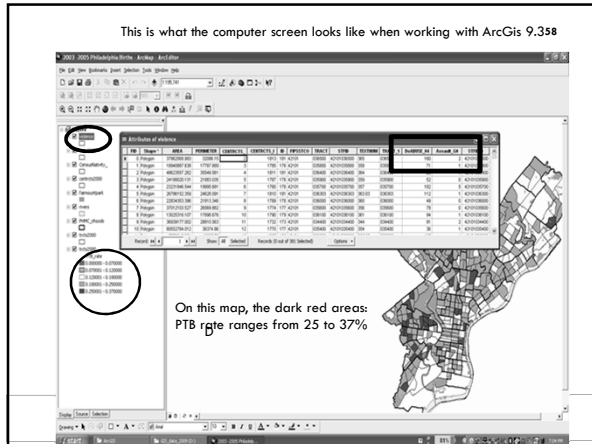
This is what the computer screen looks like when working with ArcGIS 9.3

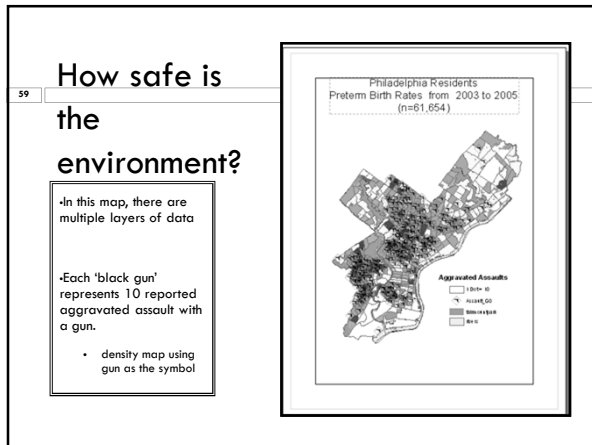
Many Sources of Data

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- Census Data
- Health Administrative Data
 - Medicare & Medicaid (individual level- must be geocoded)
- Vital Statistics
 - Birth and death records (individual level- must be geocoded)
 - Another example: Data from Birth Records used as proxy for neighborhood obesity *
- Environmental Protection Agency
 - Data from monitoring systems can be statistically modeled in geographical areas
- Crime Data – aggregated & de-identified
- Traffic data.....AND MORE!!

*Webb, Rubin, Blach & Culhane (2010). Estimating prevalence of overweight and obesity at the neighborhood level: the value of maternal height and weight data available on birth certificate records. Public Health Reports, 8 (1), 16.





Conclusions: Implications for NP Research and Practice

- GIS is an important tool for Clinical Research & Practice
 - Adverse Social Determinants are driving the Health Disadvantage of the Americans (IOM, 2013)
 - Challenge for NP research, practice and education
 - How do we tailor and target our health promotion and disease prevention to the most vulnerable?
 - Need to understand living environments
 - U.S.A. has a privatized medical/health system
 - Have NPs replaced the public health nurse of the previous century???
 - Cross-national nursing role research needed

The End
