

## *Enhancing Community Health Center PCORI Engagement (EnCoRE)*

***This work was partially supported through a  
Patient-Centered Outcomes Research Institute (PCORI) Program Award  
(NCHR 1000-30-10-10 EA-0001).***

With support from:

*N<sup>2</sup> PBRN*

funded by:





# Project Partners



Clinical Directors Network (CDN)  
New York, NY

Jonathan N. Tobin, PhD [JNTobin@CDNetwork.org](mailto:JNTobin@CDNetwork.org)



National Association of Community  
Health Centers (NACHC)  
Washington D.C.

Michelle Proser, MPP [MProser@NACHC.org](mailto:MProser@NACHC.org)  
Michelle Jester, MA [MJester@NACHC.org](mailto:MJester@NACHC.org)



The Association of Asian Pacific  
Community Health Organizations  
(AAPCHO) Oakland, CA

Rosy Chang Weir, PhD [rcweir@aapcho.org](mailto:rcweir@aapcho.org)



Access Community Health Network  
Chicago, IL

Danielle Lazar, [Danielle.Lazar@accesscommunityhealth.net](mailto:Danielle.Lazar@accesscommunityhealth.net)



Institute for Community Health  
(ICH) a Harvard Affiliated Institute  
Cambridge, MA

Shalini, A. Tendulkar, ScM, ScD [stendulkar@challiance.org](mailto:stendulkar@challiance.org)  
Leah Zallman [lzallman@challiance.org](mailto:lzallman@challiance.org)



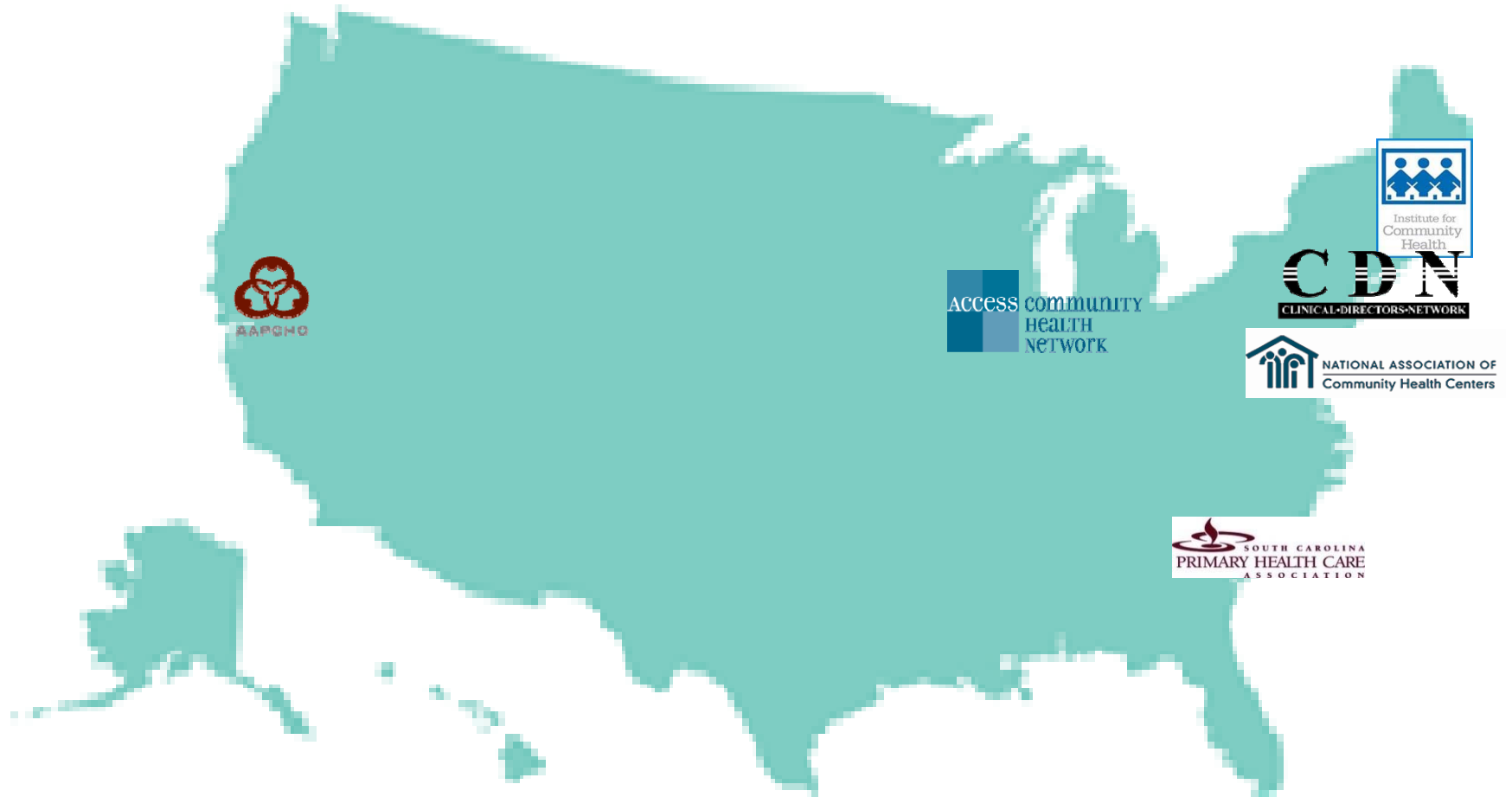
The South Carolina Primary Health  
Care Association (SCPHCA)  
Columbia, South Carolina

Vicki Young, PhD [vickiy@scphca.org](mailto:vickiy@scphca.org)





# EnCoRE Partners' Geography 2014-2015



## Goal:

To adapt, enhance, and implement an existing year long training curriculum designed to educate and engage Health Center teams including patients, clinical and administrative staff in Patient Centered Outcomes Research (PCOR).

## Objectives:

- Build infrastructure to strengthen the patient-centered comparative effectiveness research (CER) capacity of Health Centers as they develop or expand their own research infrastructure and engage in PCOR/CER
- Develop, implement, and disseminate an innovative online training, which will be targeted to and accessible at no cost to all Health Centers and other primary care practices. Content will prepare Health Center patients, staff, and researchers in the conduct of community-led PCOR
- Evaluate, refine, and disseminate training resources to Health Centers and other primary care practices nationally

# Session 4: Measurement, Measurement Error, and Descriptive Statistics

January 20, 2015

Vicki M. Young, Chief Operating Officer

South Carolina Primary Health Care Association

Vicki M. Young, PhD  
Chief Operating Officer  
South Carolina Primary Health Care Association



## Session 3

- Finalized Community Engagement Process
- Research Question Confirmed
- Research Design Selected
- Variables Selected
- Discussion of Potential Selection Bias
- Assessment of Health Center Capacity to Conduct and Resources Needed

# Training Goals

- Review and Discuss Measurement in Health Services Research
- Review Types of Measurement Error and Ways to Reduce Measurement Error
- Review Descriptive Statistics Utilized in Health Services Research



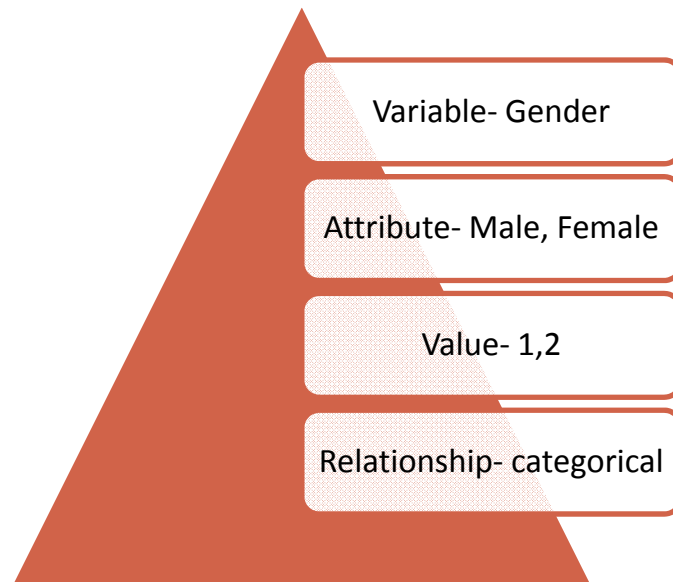
# MEASUREMENT

# Definition

- ***“Measurement is the process of specifying and operationalizing a given concept.”***
- In this instance, the research question (concept) is detailed to the point that all components of the question are defined

Source: Shi, L.(2008) *Health Services Research Methods (2<sup>nd</sup> ed.)*. Delmar Cengage Learning

- The ***level of measurement*** describes the relationship among the determined values of a variable



# Levels of Measurement

- Three Levels
  - Nominal - values describe categories of a variable (e.g., gender)
  - Ordinal- values may be rank ordered (e.g., patient use of health education materials)
  - Interval- values rank ordered and separated by equal amount (e.g., body temperature)
  - Ratio- like interval, except, these measures are based on a “true” or valued zero point (e.g., visits measured in days – 0 days has a value)
- ***Let’s Share- What Examples Do You Have?***
  - Indicate the measurement level for variables being considered for projects

# MEASUREMENT ERROR

# Measurement Error

- After measurement type/level has been established and data collected, observed differences can be attributed to true differences and/or error in measurement
  - True difference is what you're trying to capture
  - Measurement error is what you want to avoid or diminish
- Measurement error is responsible for differences that are not due to true differences between the elements/groups being studied

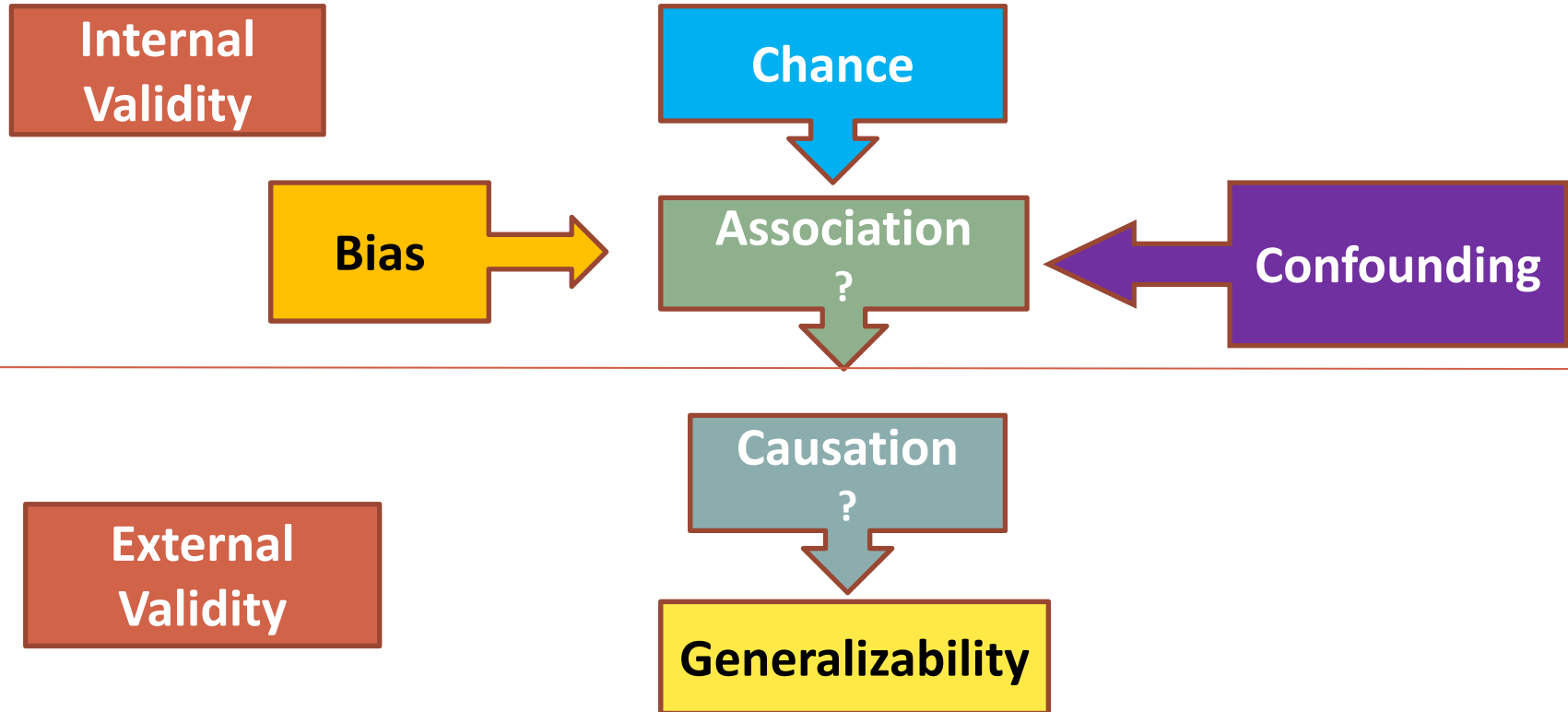
# Measurement Error

- Two Types
  - Systematic
  - Random
- Systematic
  - Inaccurate definition of the concept being studied
    - Important dimensions or categories of dimensions not included
      - Ambiguous formulation of research question
  - Research experience
    - May be introduced by observer, subject, or instrument
    - Bias in measurement
  - Therefore important to spend adequate time discussing how the concept of interest will be operationalized and measured

# Measurement Error

- Random (Non-systematic)
  - Characteristics of participants affect the measurement process
  - May be introduced by observer, subject, or instrument
    - Difference in attitude that affects the observation
    - Observer/Interview understanding in training
- Systematic error is greater threat to a study than random error
- Seek to reduce measurement error where possible
- At a minimum, study the potential error so it can be addressed and/or described





# Reduction in Measurement Error

- Validate or Use Previously Validated Measurement Tool or Procedure
- Train Observer/Researcher
- Validate Data Entry
  - Take time to review data once entered
- Conduct Statistical Procedures
- Increased Repetition in Measurement
  - Greater number of data points
- Use More than One Measure of the Same Variable

# Descriptive Statistics

# Definition and Types

- ***Descriptive statistics quantitatively describe the main features of a collection of information or data.***
  - Summarizes characteristics of groups in a manageable way
- **Univariate Analysis (examines characteristics of one variable at a time)**
  - Central Tendency
  - Dispersion
  - Distribution
- **Central Tendency**
  - Mode
  - Median
  - Mean

Source: Mann, P. S. (1995). *Introductory Statistics* (2nd ed.). Wiley

- Dispersion /Variability
  - Range
  - Variance
  - Standard Deviation
- Distribution
  - Frequency
  - Percentage

- Provides summary of information about a central value
- Mode
  - Value of the data points (distribution) that occurs most frequently
  - Most often used with nominal level data
- Median
  - Mid-point of a distribution of data points
  - Most often used with ordinal, interval, and ratio level data
  - Not affected by extreme values

- Mean
  - Arithmetic average-  $\Sigma x_i / N$  (x- observed values, N- total number of observations)
  - Most commonly used measure of central tendency
  - Only used with interval and ratio level data
  - Arithmetic properties are useful in inferential statistics
  - Extreme values do affect the mean

# Measures of Dispersion/Variability

- Refers to spread of the distribution of observations
- Range
  - Difference between highest and lowest value of a distribution
  - Used with ordinal, interval, and ratio data
  - Only takes maximum and minimum values into consideration
- Variance
  - Depicts the extent of the difference between the mean and each observation in the distribution
  - Average squared deviation from the mean
  - Variance =  $\sum (x_i - \text{mean})^2 / N - 1$
  - Used only with interval and ratio data



# Measures of Dispersion/Variability

- Standard Deviation
  - More accurate and detailed measure of dispersion than range
  - More intuitive measure of variability
  - Square root of variance
  - Used only with interval and ratio level data

# Measures of Distribution

- Distribution is a summary of categorized values of a variable
- Graphically, the density function of a normal distribution is what we refer to as the normal or bell curve
- Frequency Distribution
  - Number of cases per category
- Percentage Distribution
  - Number of cases per category divided by the total number of cases divided by 100
- Example
  - Frequency of staff by position type (i.e., administrative, clinical, support)
- ***Let's Share- Think about QI projects your organization has conducted***
  - Share use of frequency/percentage to describe distribution

- Standardizing Operations or Measures
  - Ratio
    - Frequency of observations in one category divided by the frequency in another category
    - Example
      - Ratio of children to adults with missing BMI measures during a calendar year
  - Rate
    - Number of cases/events in a category divided by the total number of observations multiplied by 100 or 1000
    - Example
      - Birth rate- number of births in a population per 1,000
  - **Let's Share!**
    - What rates or ratios have the biggest impact/burden in your communities?

- Measures of Morbidity
  - Incidence
    - Number of **NEW** cases of a disease
      - Defined population
      - Specified time period
  - Prevalence
    - Number of cases of a disease
      - Defined population
      - Specific point in time
- Measure of Risk
  - Attributable Risk
    - Difference in rate of a disease/condition in an exposed population and the rate in an unexposed population
    - Difference in risk of exposed and unexposed individuals

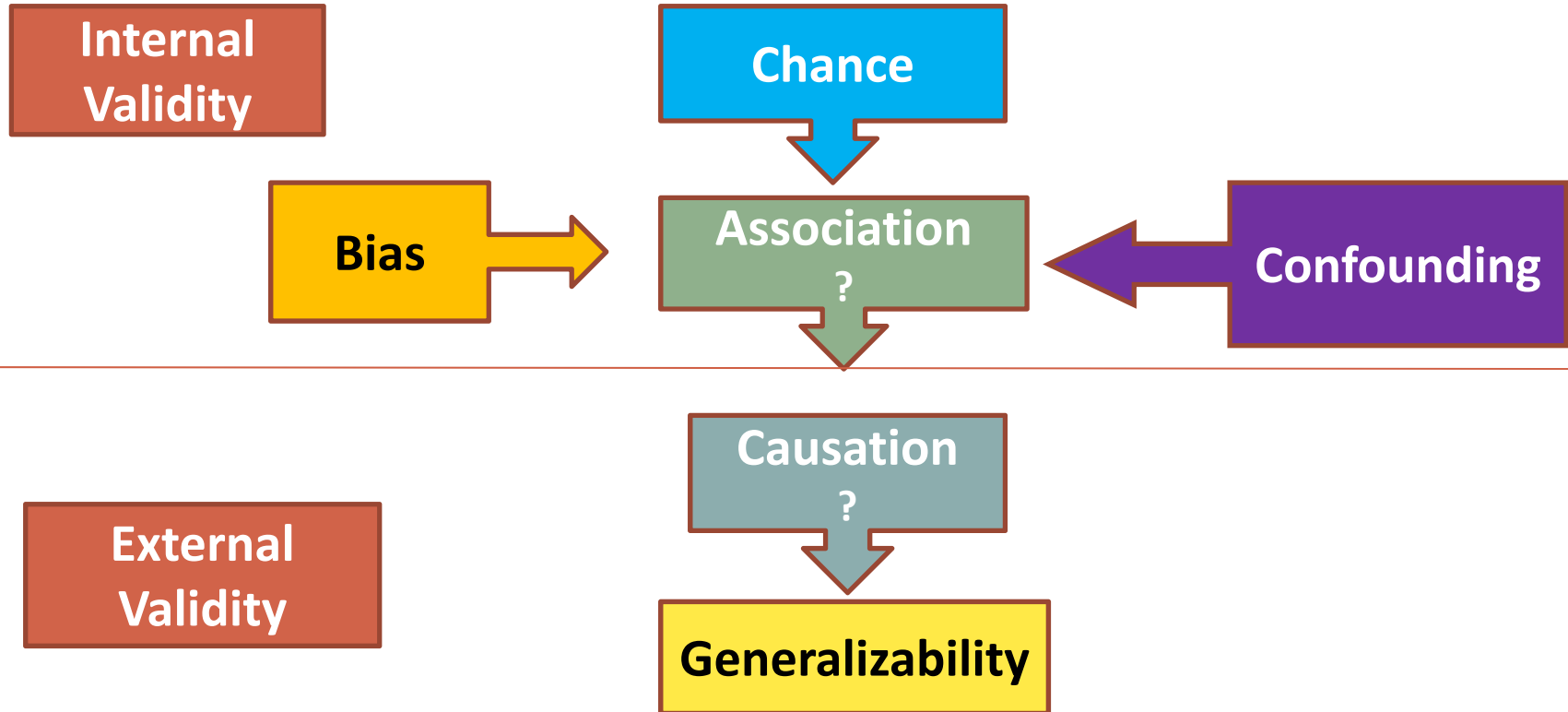
# Measure of Association

- Bivariate Measures
  - Relative Risk (RR)
    - Measures strength of association between independent variable (e.g., risk factor) and an outcome (occurrence of event)
      - Risk of developing an outcome based on exposure to independent variable
      - $RR = \text{Incidence in exposed group} / \text{Incidence of disease in unexposed group}$
    - Use in prospective studies – randomized clinical trial or cohort study
    - Confidence Interval
      - Estimated range that is likely to include the value of the variable/indicator of interest
        - Calculated from sample data.

Source: Easton, V.J. *Statistics Glossary* (v1.1).

# Measure of Association

- Bivariate Measures
  - Odds Ratio (OR)
    - Measures strength of association between independent variable and an outcome (occurrence of event)
      - Ratio of the odds of developing a disease (an outcome) given exposure ( independent variable) and the odds of developing the disease given non-exposure
  - Used in retrospective- case-control studies
  - In rare conditions, OR approximates the RR



# Questions?



# Discussion



# Homework

Complete/Answer the Following Tasks/Questions

- Define and finalize the testable hypothesis
- Are outcomes clinical outcomes or patient centered outcomes (care delivery/systems)?
- Identify the main outcome (dependent variable)
- Identify independent variable(s)
- Identify potential bias and confounders
- Has a database been identified?
- Has appropriate statistical software been identified?
- Determine appropriated descriptive statistics

- Sources

- Shi, L.(2008) *Health Services Research Methods (2<sup>nd</sup> ed.)*. Delmar Cengage Learning
- Harvard Community Catalyst. Building Primary Care Research Infrastructure at Your Community Health Center. Module 1: Research and QI
- Source: Mann, P. S. (1995). *Introductory Statistics (2nd ed.)*. Wiley
- Easton, V.J. *Statistics Glossary (v1.1)*.



# Next Webinar

## Sample Size, Power Calculations, and Sampling Methods

Tuesday, February 17<sup>th</sup>

3:30 – 5:00 pm EST



# Thank You!



## Vicki M. Young, PhD

Chief Operating Officer,  
South Carolina Primary Health Care Association

T: (803) 788-2778

E: [vickiy@scphca.org](mailto:vickiy@scphca.org)