A Structural Equation Modeling: An Alternate Technique in Predicting Medical Appointment Adherence

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THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

I, Yeow Chye Ng have no relevant financial, professional, or personal relationships to disclose.

Objectives:

1. The learner will be able to understand the principles behind causality.
2. The learner will be able to understand the basic steps to building a model of the phenomenon of interest.
3. The learner will be able to construct/interpret path diagrams
4. Understand the basic principles of how models are tested using SEM

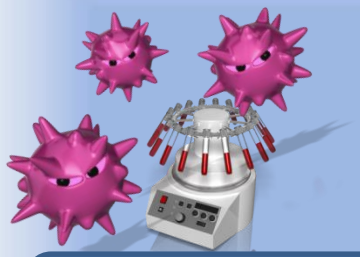
Introduction

- 1.2 million people are living with HIV in the US
- There are approximately 50,000 newly reported HIV-infected cases (each year)
- More than 16,000 people die with AIDS in the US (Death of persons with an AIDS diagnosis may be due to any cause)
- Life expectancy of HIV is longer due to advances in medication. However, this is only possible if patients adhere to their medication regimen.

(Centers for Disease Control and Prevention, 2012).

Background

Background



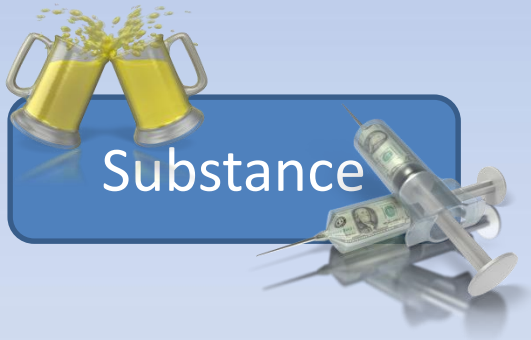
Markers for HIV disease progression

Social network

Distance to treatment facility

Health Insurance

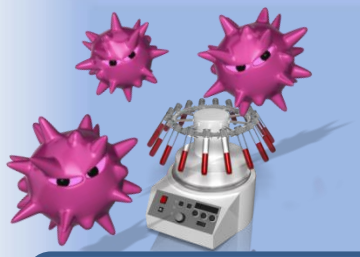
Depression



Substance

Adherence

Background



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Structural Equation Modeling

In this study, SEM was implemented to:

(1) explore the relationships among the variables in the path models, and
(2) determine the fit of the model with the data.

An Overview of the SEM Process

Specify a model with path diagram

Show with a path diagram how the variables are believed to be related

Model variables identification

Test whether the variances and covariances fit the model that has been constructed.

Run statistical tests, parameter estimates, and standard errors for the numerical coefficients in the linear equations

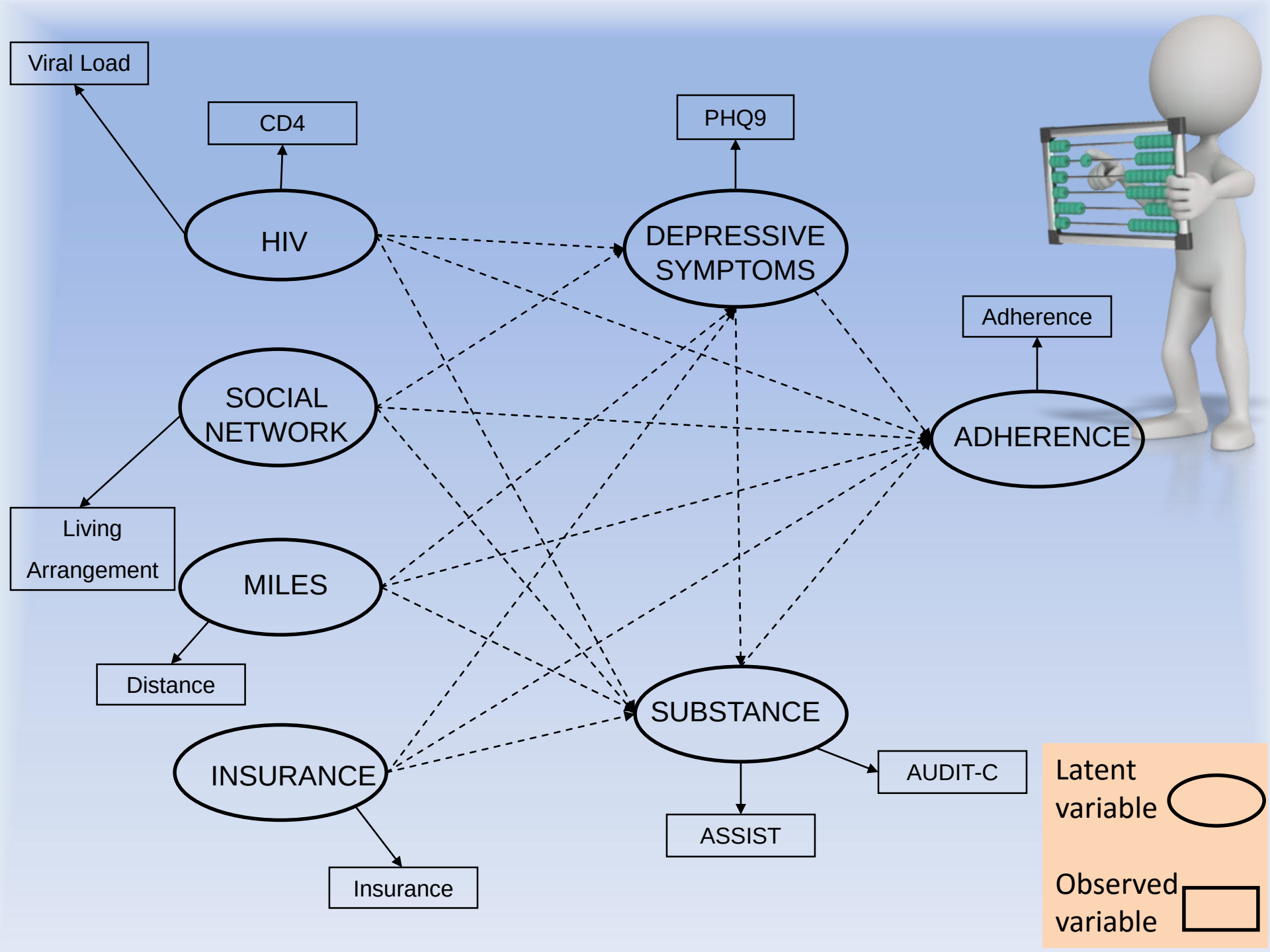
Maximum Likelihood Estimation (MLE)

Using the reported statistics, decide if the model generated is a good fit to the data

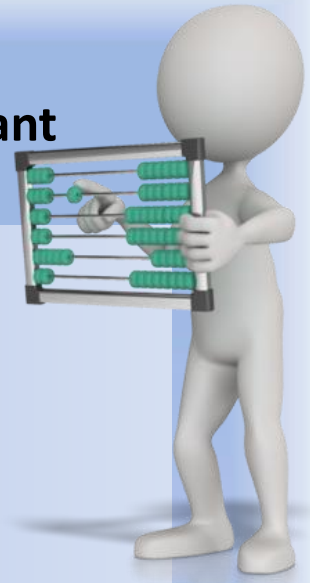
The minimum fit function Chi-square
Goodness-of-Fit Index (GFI)
Comparative Fit Index (CFI)
Root Mean Square Error of Approximation Index (RMSEA)

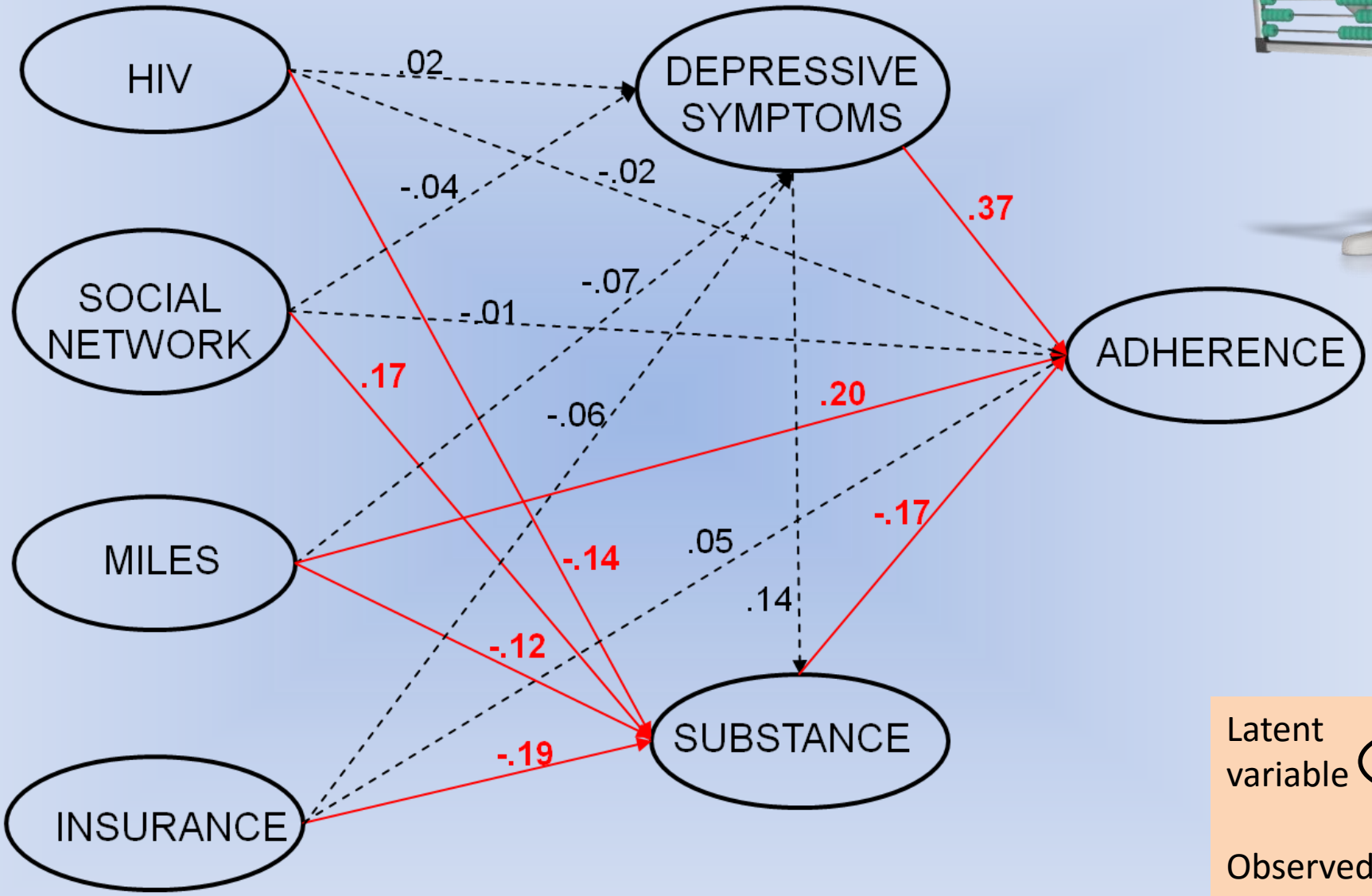
Model manipulation

Examine path coefficients to determine if it is good fit, with modification if needed. Determine if data findings support hypothesized relationships among variables.


Viral Load
CD4
PHQ9
HIV
DEPRESSIVE SYMPTOMS
Adherence
SOCIAL NETWORK
ADHERENCE
Living Arrangement
MILES
Distance
SUBSTANCE
INSURANCE
AUDIT-C
ASSIST
Insurance
Latent variable
Observed variable

Trimmed structural equation model predicting medical appointment adherence (standardized solution). All solid red lines represent significant effects (p <.05); broken lines indicate proposed non-significant paths.

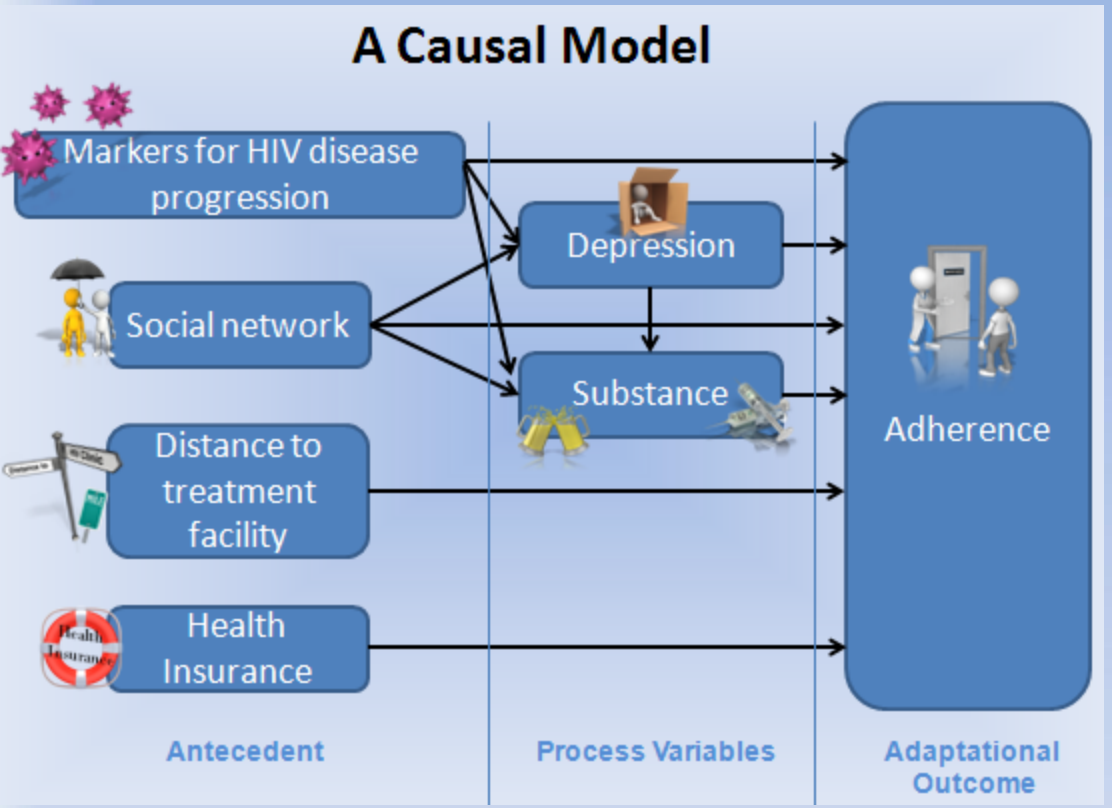




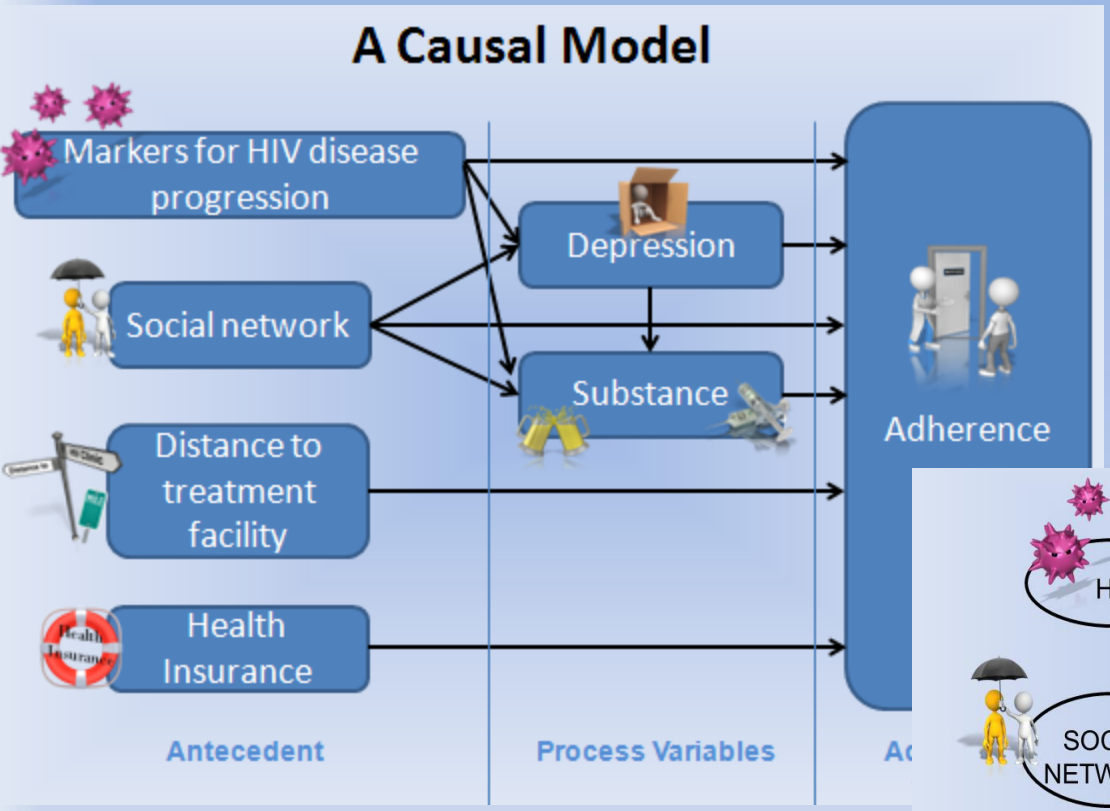
Latent variable

Observed variable

Findings


A Causal Model
Markers for HIV disease progression
Social network
Distance to treatment facility
Health Insurance
Depression
Substance
Adherence
Antecedent
Process Variables
Adaptational Outcome

Findings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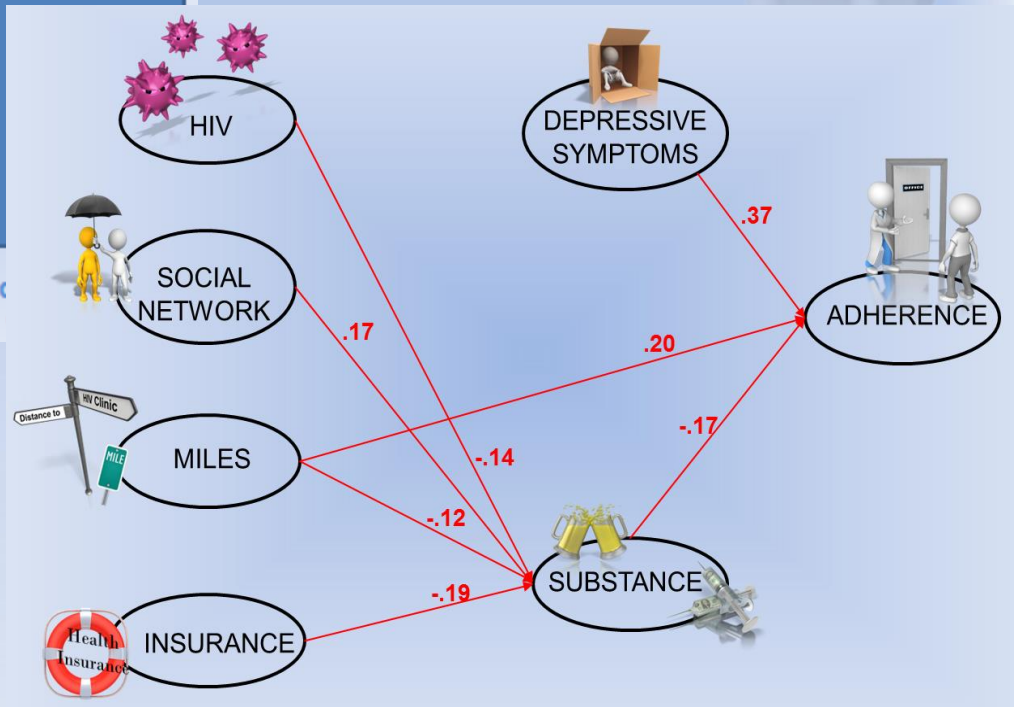
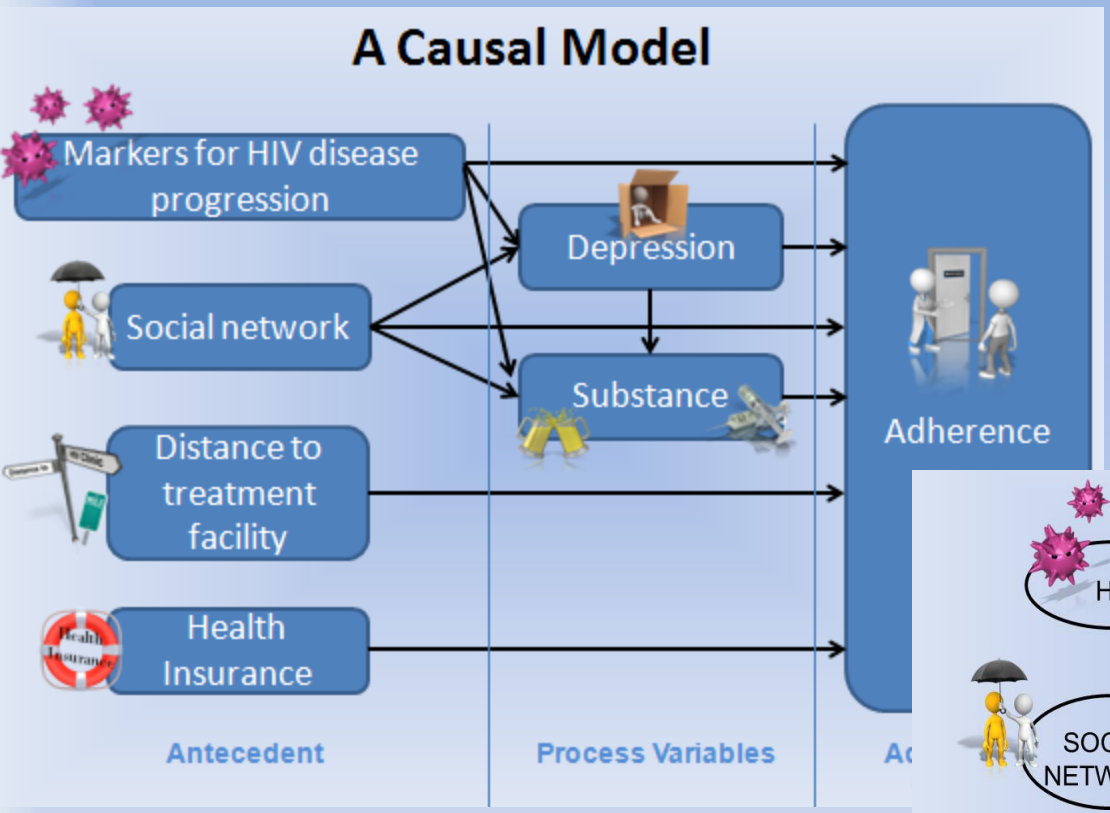
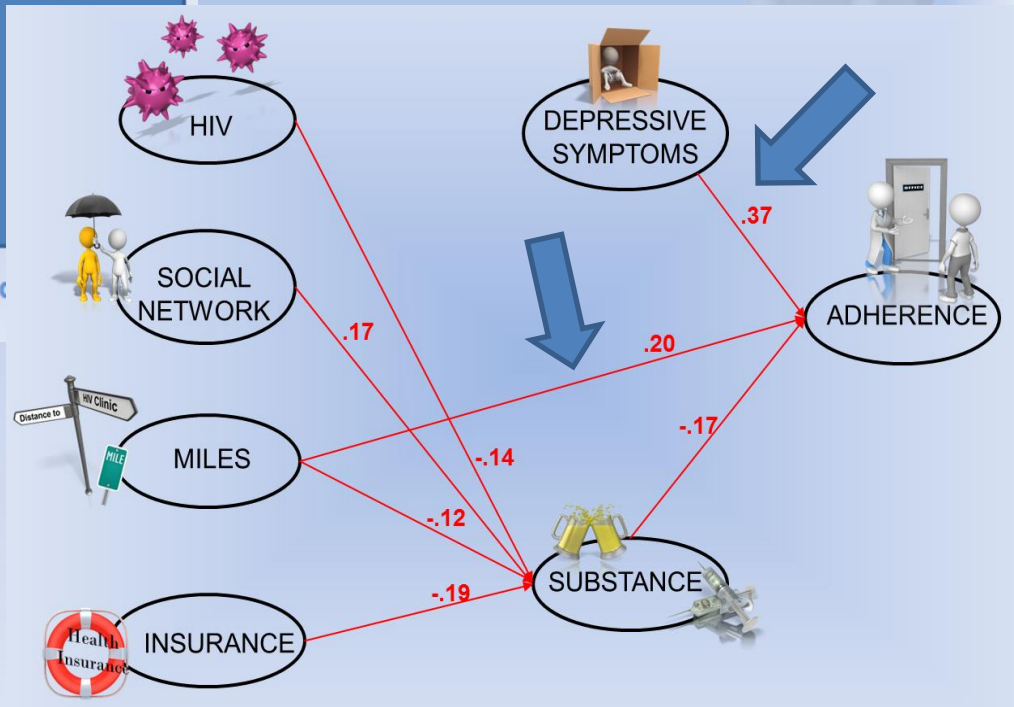

HIV
DEPRESSIVE SYMPTOMS
SOCIAL NETWORK
ADHERENCE
MILES
SUBSTANCE
INSURANCE
.37
.17
.20
-.17
-.14
-.12
-.19

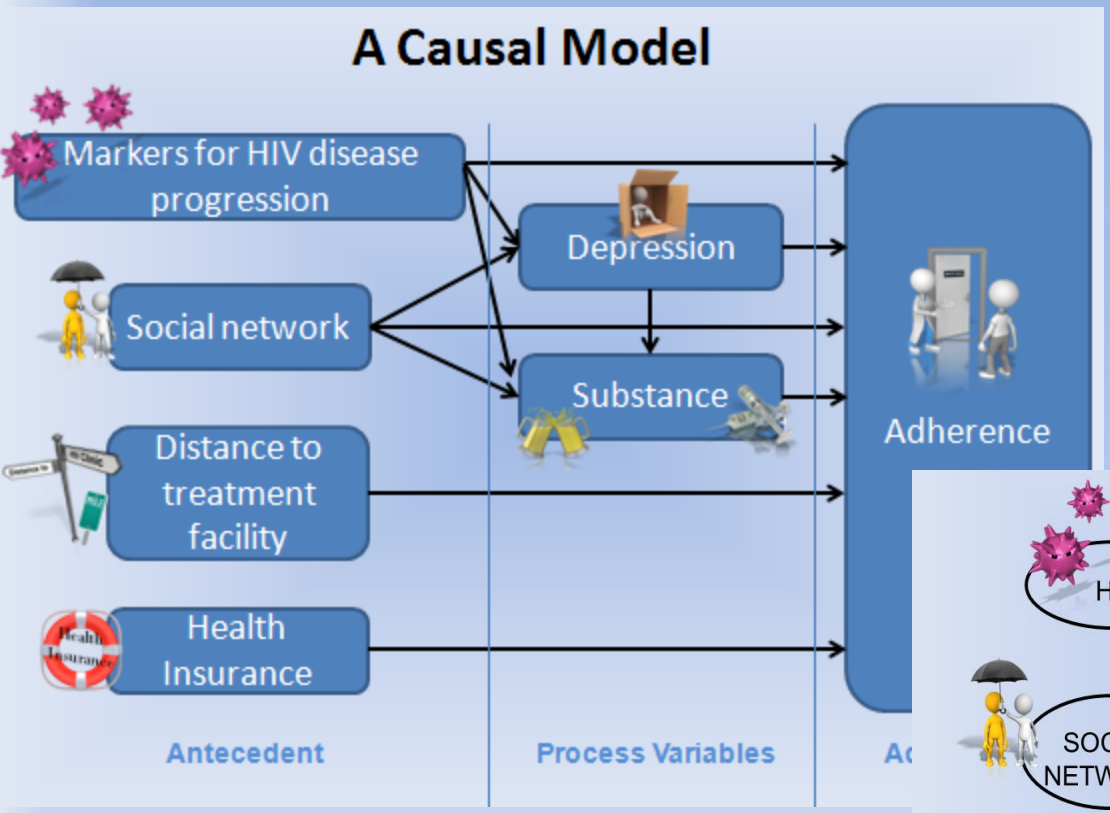
Findings

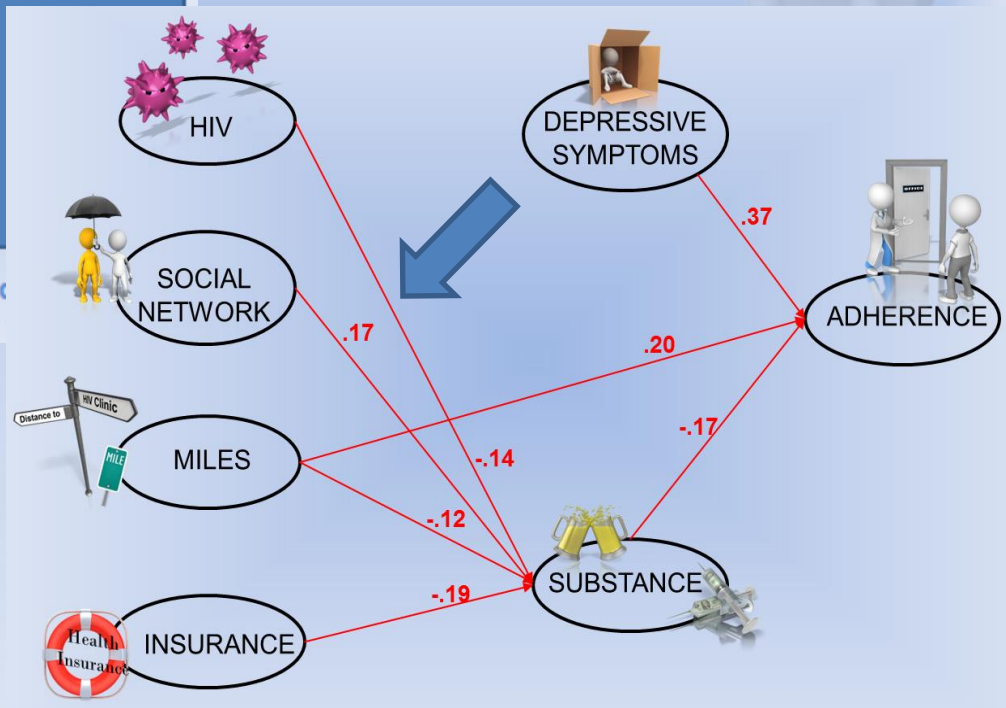




Depression and distance to treatment facility were found to have direct positive effects on adherence to medical appointments.

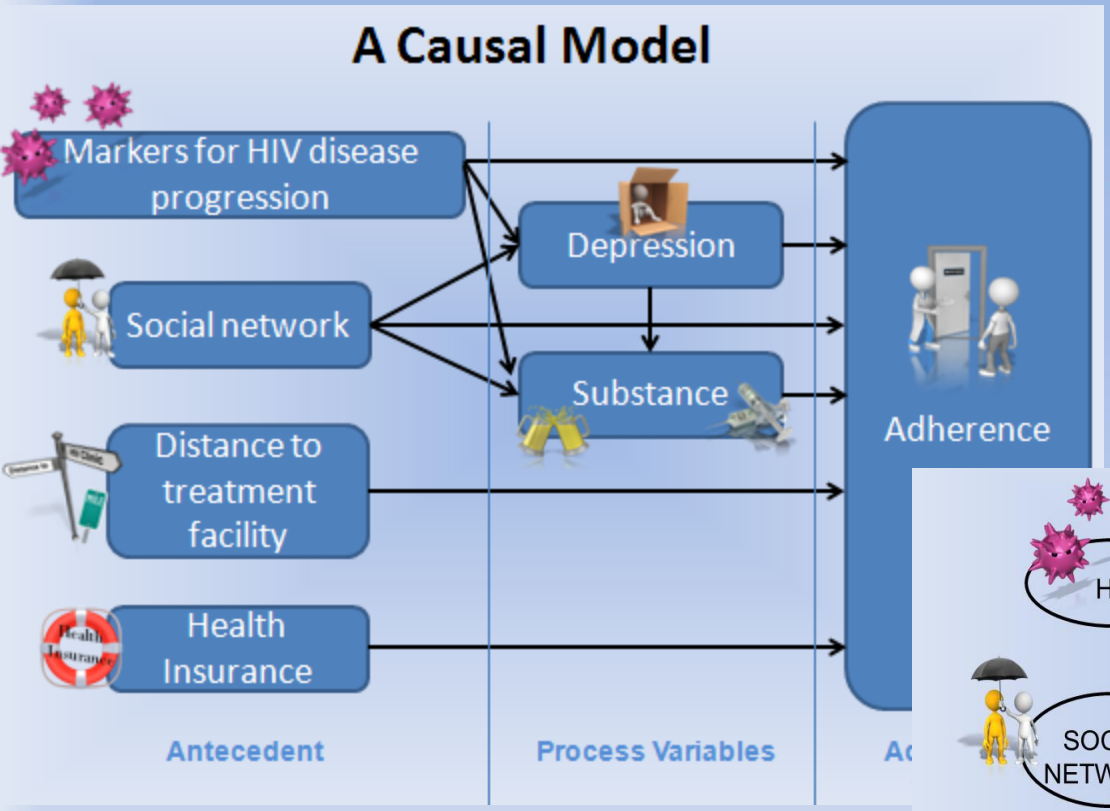
Findings

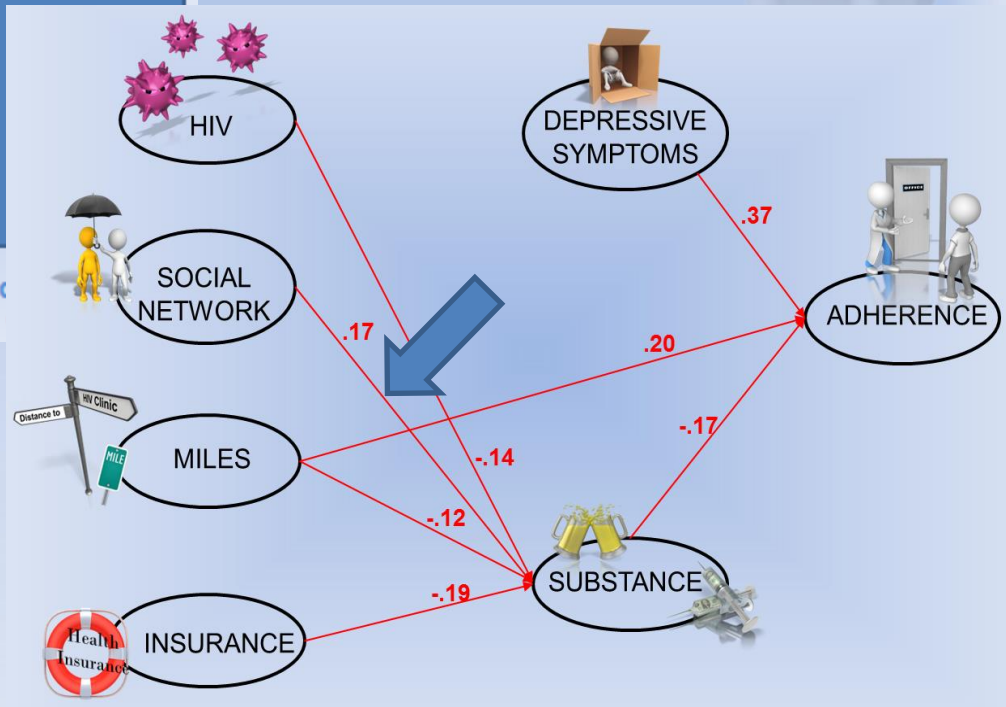




HIV disease progression had a direct negative effect on substance abuse.

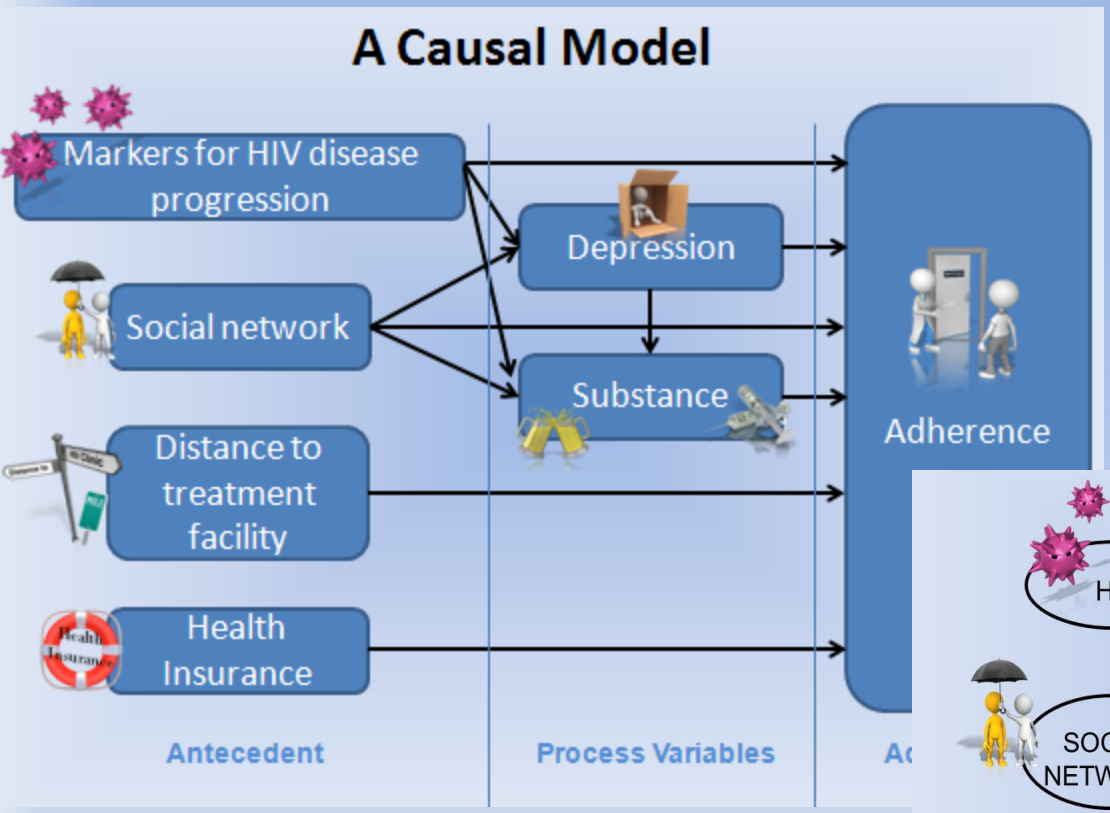
Findings

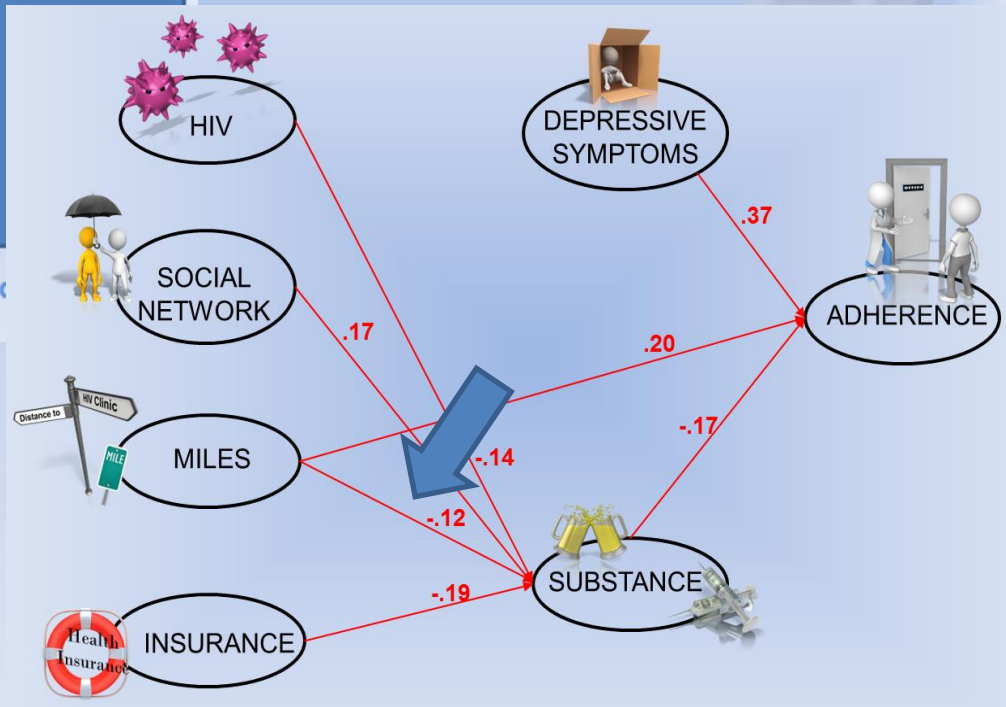




Social network had a positive direct effect on substance abuse

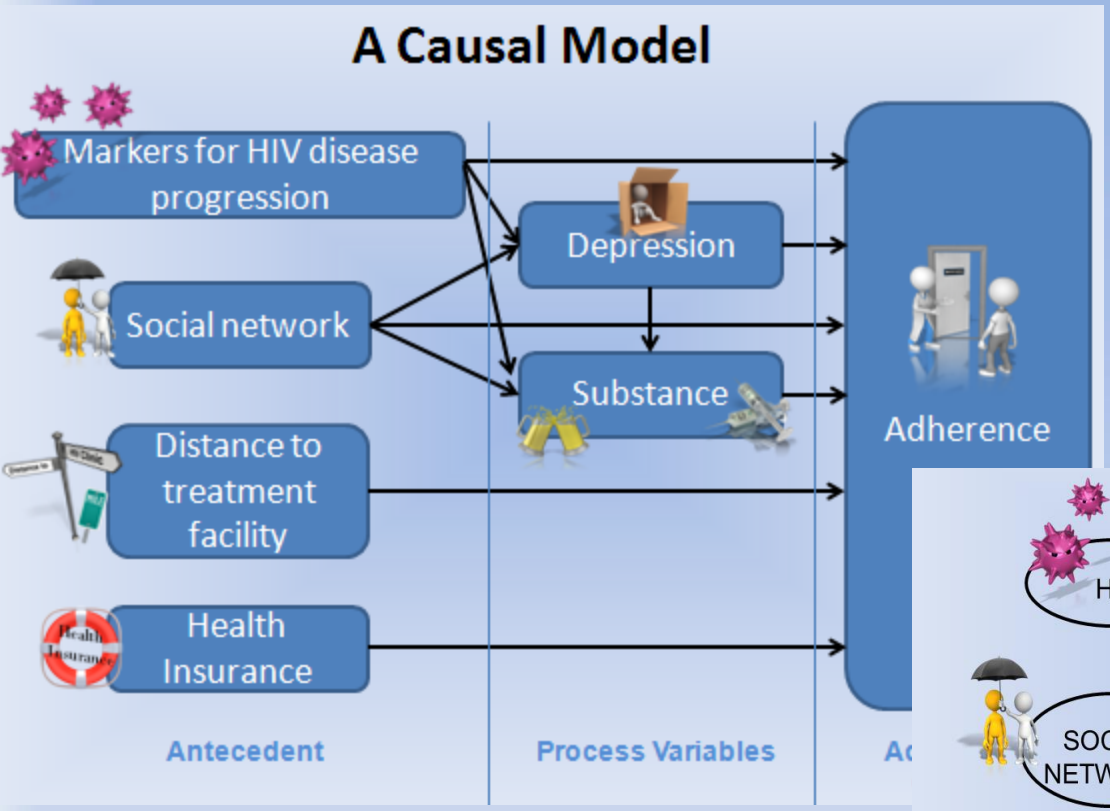
Findings

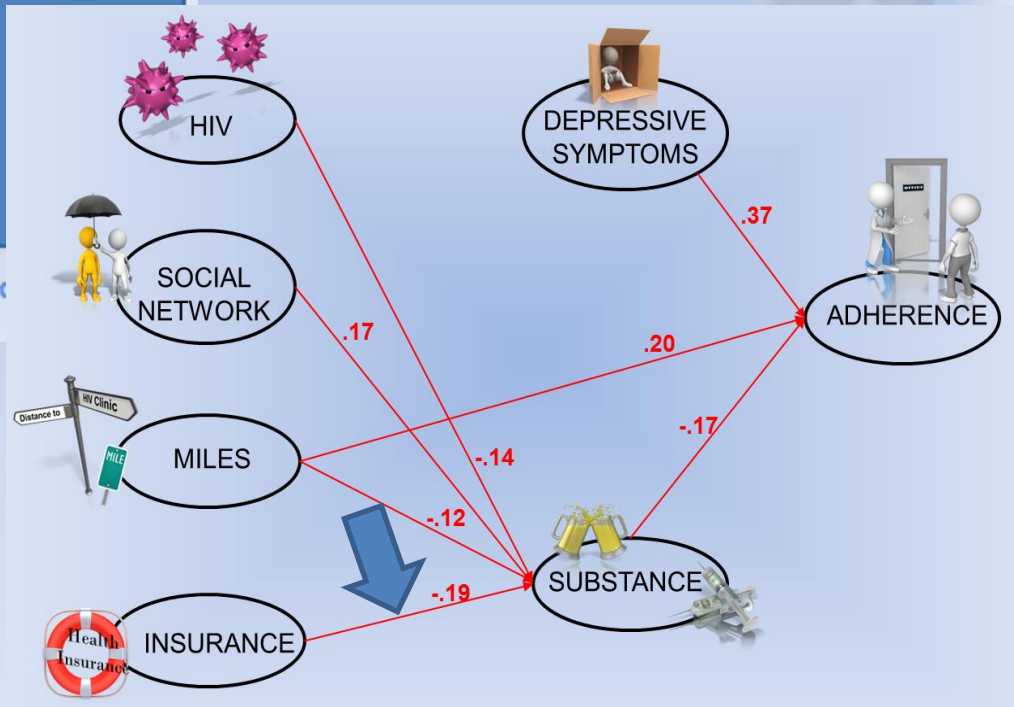




Distance to treatment facility was found to have direct negative effects on substance abuse.

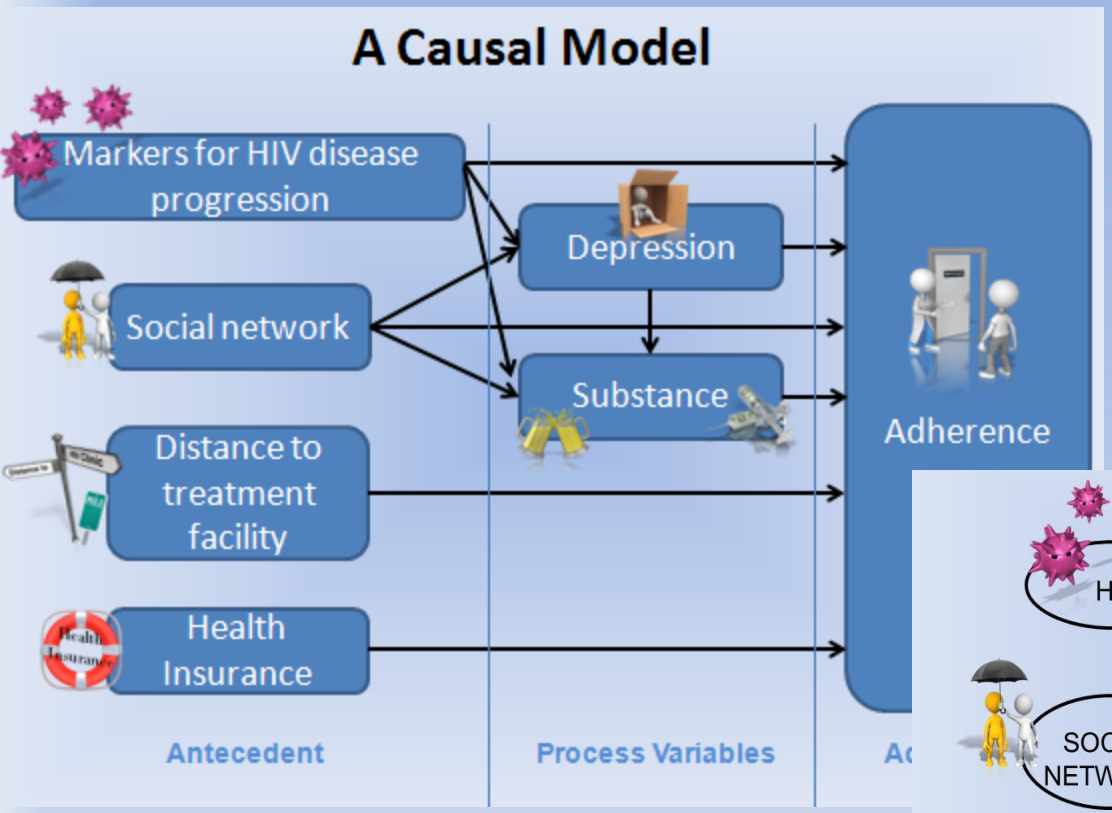
Findings

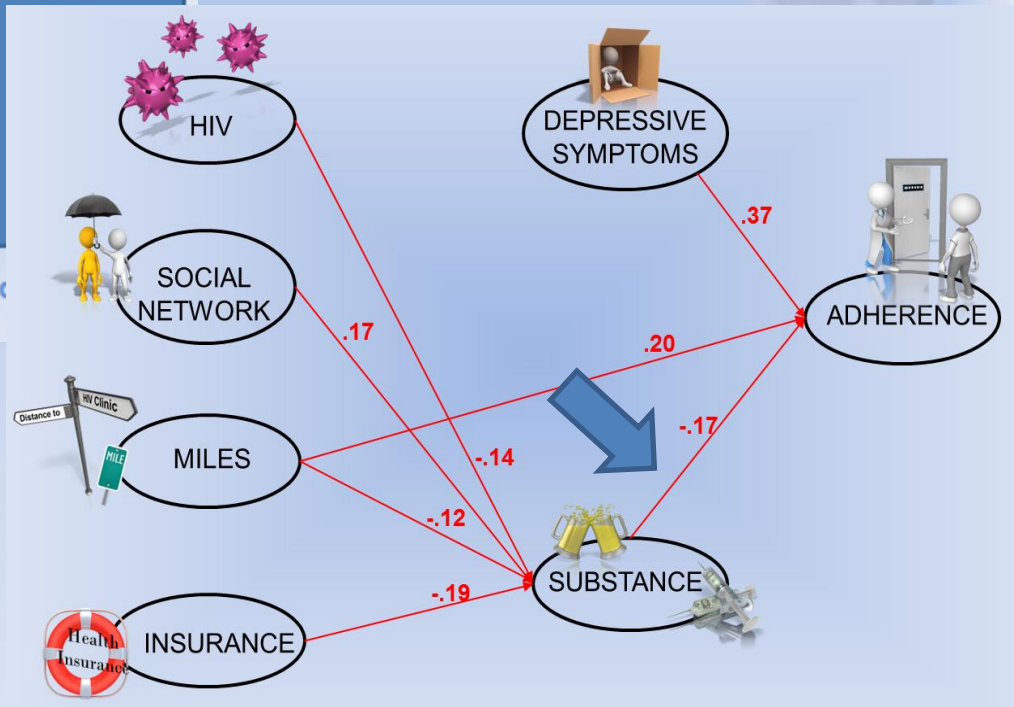




Insurance was found to have direct negative effects on substance abuse.

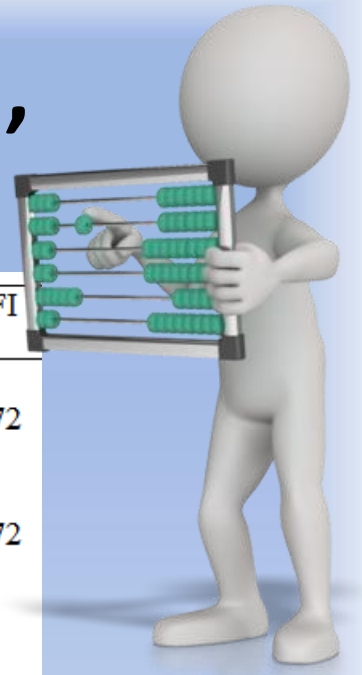
Findings





Substance abuse was found to have a direct negative effect on adherence.

Fit Measures of Baseline, Causal, and Trimmed Models



	χ^2 (df)*	GFI*	AGFI	PGFI	RMR	RMSEA*	NFI	CFI*	PNFI	RFI
Baseline model	16.70(13)[1]	0.99	0.96	0.29	0.03	0.03	0.90	0.97	0.32	0.72
Full causal model	16.70(13)[1]	0.99	0.96	0.29	0.03	0.03	0.90	0.97	0.32	0.72
Trimmed model	22.31(21)[2]	0.99	0.97	0.46	0.04	0.01	0.86	0.99	0.50	0.76

Notes: AGFI = Adjusted Goodness-of-Fit Index; CFI = Comparative Fit Index; df = degree of freedom; GFI = Goodness-of-Fit Index; NFI = Normed Fit Index; PGFI = Parsimony Goodness-of-Fit Index; RFI = Relative Fit Index; RMR = Root Mean Residual; RMEA = Root Mean Square Error of Approximation.

[1] $p = 0.213$

[2] $p = 0.38$

*Selected indices for the study

Conclusion

- A path analysis structural equation modeling (SEM) was implemented to verify the causal model of the relationships among variables based on theory and empirical evidence. Relevant statistical testing such as chi-square fit index was implemented to determine if the proposed model should be accepted or rejected. In the event where a fit did not occur, modification of the path was conducted through model reduction and modification, an approach commonly called “theory trimming.”

- This presentation provides an overview of the SEM process to the reader(s). It also underscores the capability of utilizing structural equation path analysis in assessing the effects of multiple psychosocial factors with respect to their influence on medical appointment adherence.

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Questions?

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* Reference available upon request