

**Influence of Individual Level
Characteristics on Changes in Child and
Adolescent Emotional and Behavioral
Problems:
*A Multi-Level Analysis***

John W. Gilford Jr., Ph.D.
Bob Stephens, Ph.D.

May, 30 2002



National Evaluation of the Comprehensive Community Mental Health Services for Children and Their Families Program

- Initiated in 1994 by Center for Mental Health Services
- Five year outcome-based evaluation
- Phase I included awards to 22 grantees





Grantee Sites of the Comprehensive Community Mental Health Services for Children and Their Families Program



Guiding Principles of the CMHS Initiative

- Family Focused
- Individualized
- Culturally Competent
- Interagency Involvement



Guiding Principles of the CMHS Initiative

- Community Based
- Accessible
- Least Restrictive
- Collaborative Coordinated
- Rights of Children and Families are Protected



Components of the National Evaluation

- System Level Assessment (SLA)
- Cross-sectional Descriptive Study
- Child and Family Outcome Study
- Practice Level Assessment
- Services and Costs Study



Purpose of Present Study

- To determine if symptomatology of children in present sample decreases over time
- To determine if a statistically significant difference exists between the CBCL rates of change based upon individual level factors known at intake



Research Questions

- Does child symptomatology change over time in children with severe emotional disturbances who are receiving services through a CMHS-funded system of care?



Research Questions

- Are changes in child symptomatology over time systematically related to selected characteristics of the child's background?



Factors That Influence Outcomes

(Burns, 1996)

- System level factors
 - Principles
 - Incentives
 - Adequacy of the service system
 - Quality of treatment

- Child and family characteristics
 - Demographic
 - Clinical



Factors That Influence Outcomes

■ Previous research

- Literature pertaining to the prediction of outcomes for children with severe emotional disturbance is limited
- Findings from previous studies examining factors that influence outcomes are conflicting



Factors That Influence Outcomes

■ Previous Research

- Age: older children more problems at intake and improved slightly more
- Gender: equal severity at intake and improved equally
- Race: White children exhibited more problems at intake, yet outcomes were equal
- SES: no difference in outcome
- Substance abuse: no difference in outcome
- Presenting problem: no difference in outcome



Factors that Influence Outcomes

- Demographic factors included in present study
 - Gender
 - Age
 - Race
 - Income level



Factors that Influence Outcomes

- Clinical factors included in present study
 - Initial CBCL
 - Comorbidity
 - Level of functioning
 - Primary Diagnosis (ADHD, Conduct DO, Anxiety)
 - Risk Factors
 - Presenting Problem (Non Compliance, Hyper./Impul. DO, Suicidal Ideations, substance abuse)



Characteristics of Sample: Demographic

(N = 514)

Mean age	13.4 yrs. (sd = 2.53)
Gender	
Male	68.7%
Ethnicity	
White, Non Hispanic	63.2%
Hispanic	14.2%
African American	12.1%
Other	10.5%
Custody	
Mother	47.5%
Both parents	27.0%
Other	25.5%
Family income	
% Living below income level of \$15,000/year	54.0%



Characteristics of Sample: Clinical

Primary diagnosis

Conduct related	39.3%
Depression/Dysthymia	23.2%
ADHD	21.6%
Anxiety	6.8%

Referral source

Mental health agency	21.6%
School	16.2%
Social service agency	15.8%
Corrections	15.8%
Parent	8.2%

Presenting problem

Physical aggression	17.5%
Noncompliance	13.8%
Hyperactive impulsive	8.8%
Substance abuse	5.6%



Characteristics of Sample

Total Risk Factors (child and family)	4.6 (SD = 2.60)
Number of contacts with legal system	3.9 (SD = 5.42)
CAFAS	113.29 (SD = 43.2)
Comorbidity	44.0%



Measure of Dependent Variable Child Behavior Checklist (CBCL)

- Assesses behavioral and emotional problems
- 8 syndrome scores
 - Internalizing
 - Withdrawn
 - Somatic complaints
 - Anxious/depressed
 - Thought problems
 - Externalizing
 - Social problems
 - Attention problems
 - Aggressive problems
 - Delinquent problems
- 17 social competence items and 113 behavior problem items
- Internal consistency (alpha) = .96
- Test-retest reliability (after 7 days) $r = .93$



Procedures

- 514 children and adolescents served by CMHS initiative
- CBCL administered 1 - 4 occasions within a 24 month timeframe.
- Calculated individual growth curves for each child in sample
- Examined between group differences based upon individual level characteristics of sample



Methods of Assessing Client Change

- Change as incremental
 - Pre/post-treatment difference score methods
- Change as a continuous process
 - Growth curve analysis - method of analyzing the change process for a group or individual
 - Individual growth trajectory - individual growth curve



Hierarchical Linear Modeling (HLM)

- HLM - refers to the hierarchical or nested structure of the data.
- For individual growth curve analysis, the repeated measures are nested within each individual.



Hierarchical Linear Modeling

■ Features

- Greater precision in estimating individual change parameters
- Incorporates an algorithm for missing data
- Parameter estimates are based upon multi-wave data (min. of 3)
- Flexible data requirements



Hierarchical Linear Modeling

■ Design Issues

- at least 3 time points
- interval/ratio scale data
- normal distribution
- cannot use standardized scores (z) at each wave



Hierarchical Linear Modeling

Two Level Model With Predictor Variables

Level 1 $Y = \eta_0 + \eta_1 * (\text{TIME}) + e$

Level 2 $\eta_0 = \beta_{00} + \beta_{01} * (\text{Pred A}) + \beta_{02} * (\text{Pred B}) + \dots + R_0$

$$\eta_1 = \beta_{10} + \beta_{11} * (\text{Pred A}) + \beta_{12} * (\text{Pred B}) + \dots + R_1$$



Steps in HLM

- Model growth trajectory of each individual in sample
- Examine within group variance to determine if intercepts and slopes vary significantly
- Exploratory analyses assessing the relationship between potential level two predictor variables and:
 - Intercepts
 - Slopes
- Examine between group variance to determine if mean group intercepts and slopes vary significantly



Estimation of Fixed Effects Unconditional Model

Fixed Effect	Coefficient	Standard Error	T-Ratio	D.F.	P-Value
Intercept	66.468	1.385	48.980	513	<0.001
Slope	-5.537	0.516	-0.733	513	<0.001
Random Effects	S.D.	Variance Component	χ^2	D.F.	P-Value
Intercept	26.150	683.808	1677.385	513	<0.001
Slope	3.433	11.782	581.032	513	<0.05
R Level 1	18.559	344.424			



Selection of Predictor Variables

- Review of literature
- Previous research
- Completeness and distribution of data
- Relationship between EB intercept and slope residuals and potential predictor variables
- HLM exploratory analysis: level-2 predictors selected for possible inclusion in subsequent HLM runs



Final Specified Model

- Level-1 Model

$$Y = B_0 + B_1 * (\text{TIME}) + R$$

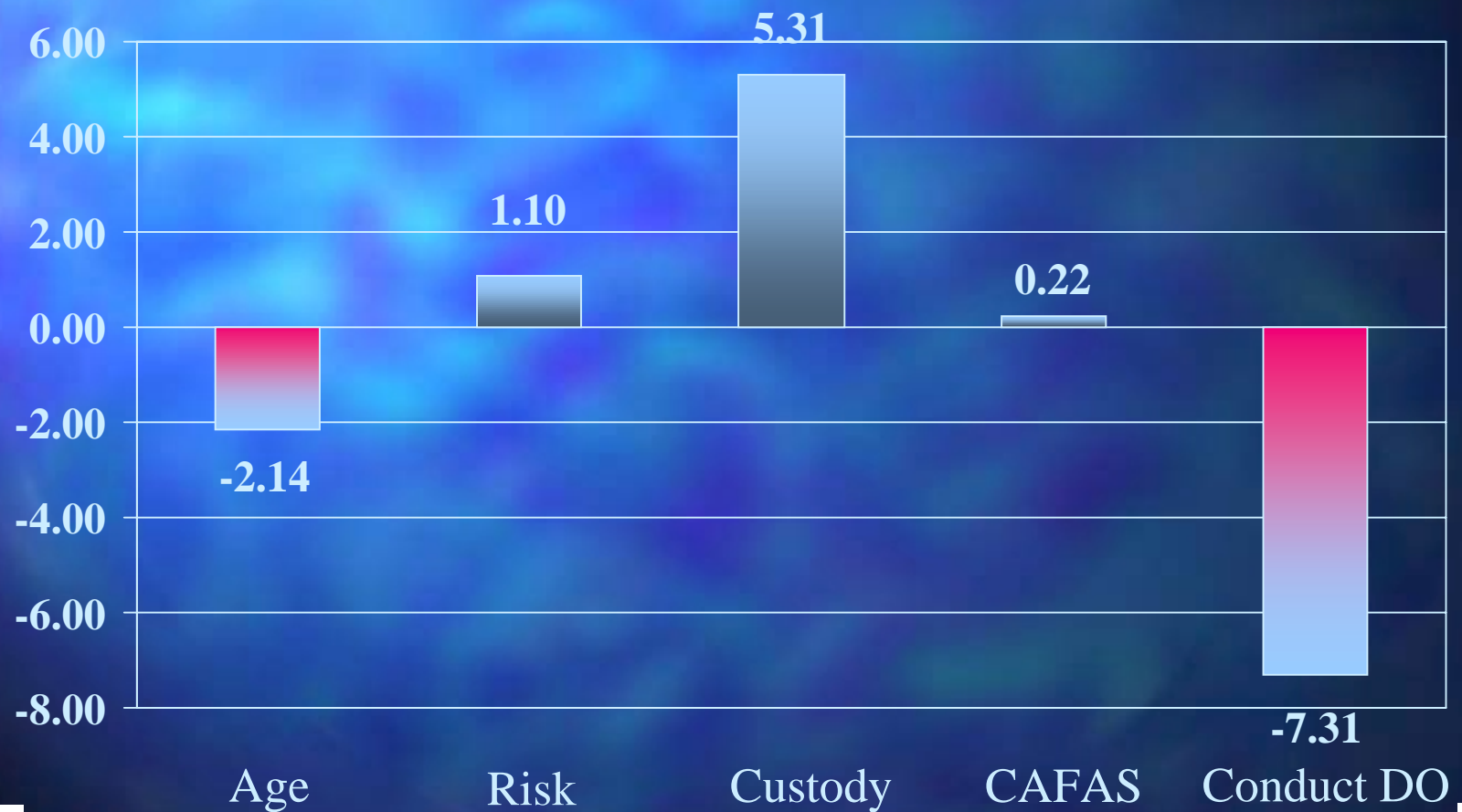
- Level-2 Model

$$B_0 = G_{00} + G_{01} * (\text{AGE}) + G_{02} * (\text{Number of Risk Factors}) + G_{03} * (\text{CAFAS}) + \\ G_{04} * (\text{Conduct Disorder}) + G_{05} * (\text{Custody Status}) + U_0$$

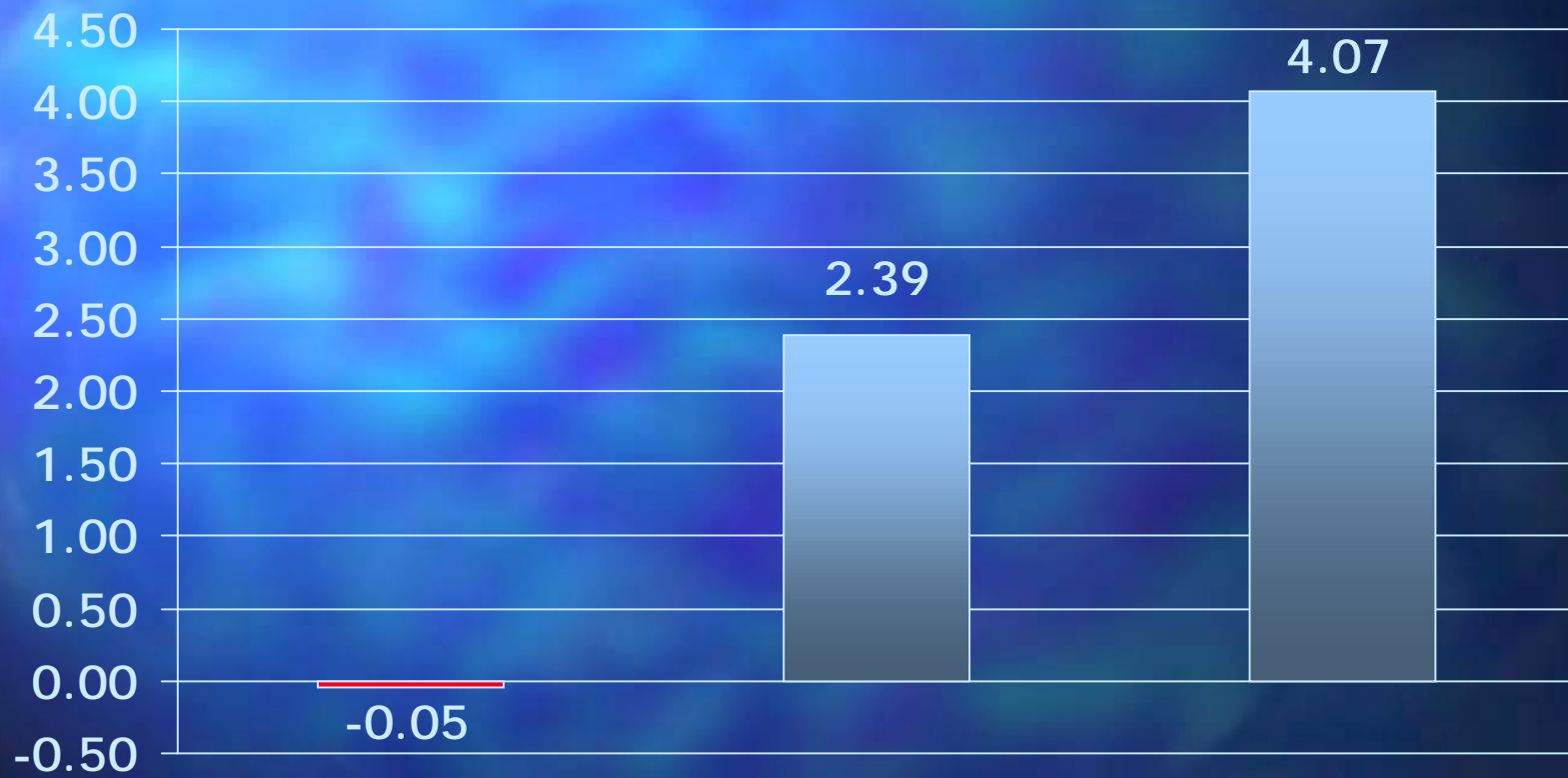
$$B_1 = G_{10} + G_{11} * (\text{CAFAS}) + G_{12} * (\text{ADHD}) + G_{13} * (\text{Race/Income}) + U_1$$



Relationship Between Predictor Variables and Intercept



Relationship Between Predictor Variables and Slope



CAFAS

ADHD

Race/Income



Estimation of Fixed Effects Final Fitted Model

Fixed Effect	Coefficient	Standard Error	T-ratio	D.F.	P-value
Intercept (Initial CBCL Score)					
Age	-2.140	1.233	53.949	508	0.000
Risk Factors	1.096	0.469	-4.259	508	0.000
Custody of Mother	5.310	2.322	2.286	508	0.019
CAFAS	0.220	0.029	7.529	508	0.022
Conduct Disorder	-7.309	2.411	-3.032	508	0.003
Slope (Rate of Change)					
CAFAS	-0.046	0.014	-3.380	510	0.001
ADHD	2.389	0.960	2.487	510	0.013
Race/Income	4.065	2.075	1.959	510	0.052



Variance Explained in Initial Status and Growth Rate

Model	Intercept	Slope
Unconditional	683.808	11.782
Conditional	524.924	6.483
Proportion of Variance Explained	30%	44.9%



Limitations

- Intervention variability
 - Fidelity of system of care implementation
- Generalizability
- Data
 - Incomplete Data
 - EM Algorithm



Conclusions

- What is the average amount of change in CBCL ?
 - On average CBCL scores decreased by 22 points over 24 month period
- Does Initial CBCL status vary significantly among individuals?
 - Results from unconditional model revealed variability among intercepts to be significant ($p < .001$)
- What is the average rate of change?
 - The average slope for the sample was -5.537



Conclusions

- Does rate of change vary significantly among individuals?
 - Results from unconditional model revealed variability among slopes to be significant ($p < .001$)
- Is there a relationship between individual level characteristics and initial CBCL score?
 - Age, risk factors, custody status, CAFAS, and conduct disorder
- Is there a statistically significant relationship between individual level characteristics and rate of change?
 - CAFAS, ADHD, Race/Income



Implications

- At the local level:
 - to guide service delivery practices
 - to inform decision making
 - to provide feedback to service providers
 - to achieve sustainability and refinancing



Implications

- To promote decisions based on proven outcomes
 - At the national level:
 - to further the national initiative to improve funding and support policy changes
 - At the State level:
 - to contribute critical information for State-level funding, policy, and programming decisions

