Parent-Youth Divergence (and Convergence) in Reports of Youth Internalizing Problems in Psychiatric Inpatient Care

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Abstract

When compared to one another, multiple informants' reports of adolescent internalizing problems often reveal low convergence. This creates challenges in the delivery of clinical services, particularly for severe outcomes linked to internalizing problems, namely suicidal thoughts and behaviors. Clinicians would benefit from methods that facilitate interpretation of multi-informant reports, particularly in inpatient settings typified by high-cost care and high-stakes decision-making. 765 adolescent inpatients (70.3% female; M_{age}=14.7) and their parents completed measures of adolescent internalizing problems. We obtained baseline clinical and treatment characteristics from electronic medical records. Latent class analyses revealed four reporting patterns: Parent-Adolescent Low (LL; 49.0%), Parent Low-Adolescent High (PL-AH; 11.5%), Parent High-Adolescent Low (PH-AL; 21.8%), Parent-Adolescent High (HH; 17.6%). Relative to the LL class, adolescents in the PH-AL and PL-AH classes were more likely to be admitted with suicidality. In terms of treatment characteristics and relative to the LL class, HH and PH-AL adolescents were more likely to receive standing antipsychotics, PH-AL adolescents were more likely to be in seclusion, and HH adolescents had longer hospital stays. At discharge and relative to the LL class, HH, PH-AL, and PL-AH adolescents were more likely to receive an anxiety disorder diagnosis. Further, HH, PH-AL, and PL-AH adolescents were more likely to receive partial hospitalization or care in another restrictive environment after inpatient treatment, relative to the LL class. This naturalistic study informs clinical decision-making by aiding our understanding of how multi-informant reports facilitate interpretations of adolescents' clinical presentations as well as predictions about treatment characteristics.

Key words: Inpatient, assessment, multi-informant, internalizing problems, clinical utility

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Adolescence is a developmental period marked by increased risk for nearly all mental health disorders, with anxiety and mood disorders being among the most common and impairing during this period (Merikangas et al., 2010). During adolescence, depression, anxiety, and somatic symptoms, and in particular comorbid mood and anxiety disorders, pose risk for initial onset and rapid increase of suicidal ideation and behavior (SIB) (Capron, Allan, Ialongo, Leen-Feldner, & Schmidt, 2015; Crawford et al., 2018; Cummings, Caporino, & Kendall, 2014; Nock, 2016; O'Neil Rodriguez & Kendall, 2014). Rates of suicidal ideation (12.1%), suicide plans (4.0%), and suicide attempts (4.1%) are particularly high in this developmental period, relative to earlier and later periods (Nock et al., 2013). Internalizing problems and SIB can become so impairing that psychiatric hospitalization is required for stabilization and initiation of treatment. Among adolescents, psychiatric hospitalization has increased substantially in recent decades, and particularly for adolescents with internalizing problems and SIB (Blader, 2011; Friedman et al., 2011), and suicide remains the second leading cause of death among 10 to 24 year olds (Sullivan, Annest, Simon, Luo, & Dahlberg, 2015). From 2006 to 2011, psychiatric hospitalization of early adolescents increased by nearly 50% (Torio et al., 2015). Although psychiatric hospitalization is necessary for some adolescents, it is among the most expensive and resource intensive types of care available (James et al., 2010).

In this study, we seek to improve the ability of assessments of internalizing problems to facilitate interpretation of adolescents' clinical presentations and prediction of treatment characteristics when undergoing psychiatric hospitalization. Importantly, when adolescents display signs and symptoms of internalizing problems, they often do so covertly, as core features

of this problem domain are relatively difficult to directly observe (e.g., worries, negative affect, headaches). The challenge in assessing internalizing problems can be addressed, in part, by collecting reports from multiple informants who each observe adolescents in distinct ways (Kraemer et al., 2003). To assess adolescents' internalizing problems, the most common information sources consist of adolescents' self-reports and those of the key referral source for treatment, namely parents (Klein, Dougherty, & Olino, 2005; Silverman & Ollendick, 2005). Given that adolescents and parents observe internalizing problems from unique perspectives, it is not surprising that their reports often display low-to-moderate convergence estimates (i.e., *r*s=.20) (Achenbach, McConaughy, & Howell, 1987; De Los Reyes et al, 2015), including in psychiatric inpatient settings (Klaus, Mobilio, & King, 2009; Prinstein et al., 2008).

The low levels of convergence between parent-adolescent reports of internalizing problems are thought to primarily reflect two elements. First, adolescents vary considerably in the social contexts in which they display mental health concerns (e.g., home, school, peer interactions) (Achenbach et al., 1987). Second, significant others such as parents vary in their capacities for observing adolescents within and across these contexts (Kraemer et al., 2003). Historically, this low convergence has presented challenges in the delivery of care. For example, informants rarely agree on which adolescent problems should be targeted in treatment, making treatment planning and monitoring difficult (Hawley & Weisz, 2003). Despite the ubiquity of this low reporting convergence and its treatment implications, no consensus guidelines exist for using multi-informant reports to make clinical decisions (Beidas et al., 2015). Combinational rules such as the "OR" rule (i.e., "counting" a symptom as "present" if any informant endorses its presence) and "AND" rule (i.e., requiring two or more informants to endorse a symptom to "count" a symptom as "present") have long been recommended as strategies for integrating

informants' reports (Bird, Gould, & Staghezza, 1992; Jensen et al., 1999; Piacentini, Cohen, & Cohen, 1992). However, there is scant empirical work demonstrating that these approaches actually improve the precision of psychiatric diagnoses and clinical decision-making (De Los Reyes et al., 2015). Further, these approaches do not promote identification of meaningful patterns among informants' reports (e.g., which informant reports higher levels of problems relative to another informant). This is because both "OR" and "AND" rules do not contain information regarding *which* informants endorsed concerns. In fact, in the case of the "OR" rule, its use requires completely disregarding informants' reports if they disagree with the one informant who positively endorses concerns. Further, in addition to failing to contain information on the source of endorsement, by definition the "OR" rule "counts" endorsement by two or more informants the same as endorsement by only one informant.

Consequently, in this study we leverage an integrative approach that combines the principles of combinational algorithms while preserving information about the informant endorsing the presence of internalizing problems (e.g., parent-only, youth-only, both). The value of this approach is that it yields important clinical tools precisely because it capitalizes on both the inherent difficulty in observing internalizing problems *and* the variability in patterns of convergence among cross-informant reports. Indeed, recent work finds that, despite the overall low convergence observed in multi-informant assessments, dyads of informants display profound individual differences in their reporting patterns. In fact, one can reliably identify these patterns using person-centered modeling techniques (e.g., Latent Class Analysis [LCA]) (De Los Reyes, Alfano, Lau, Augenstein, & Borelli, 2016; De Los Reyes, Henry, Tolan, & Wakschlag, 2009; Lerner, De Los Reyes, Drabick, Gerber, & Gadow, 2017; Lippold, Greenberg, & Collins, 2013, 2014; Makol & Polo, 2018). This approach improves upon combinational algorithms (e.g., "OR"

and "AND" rules) in that it allows for the examination of meaningful patterns among informants' reports, and particularly the nature of convergence and divergence among these reports. Coupled with the latest conceptual model for interpreting these patterns—the Operations Triad Model (see De Los Reyes, Thomas, Goodman, & Kundey, 2013)—assessors now have powerful tools for interpreting reporting patterns. In this model, *convergence* between adolescent and parent reports may reflect meaningful *consistencies* in displays of behaviors across contexts. When parents and adolescents converge in reports of high levels of adolescent problems, this may be a marker for higher severity and functional impairment, indicating that problems are more pervasive, consistent, and observable (De Los Reyes & Ohannessian, 2016). Convergence in low levels of adolescent problems across informants also provides useful assessment information, namely that clinical concerns are not present across contexts and perspectives. Prior work leveraging LCA techniques supports that informant convergence in reports of high levels of youth problems reflect greater problem severity and impairment, and increased likelihood that youth receive psychotropic medication, diagnosis, and mental health services (De Los Reyes et al., 2009; Lerner et al., 2017; Makol & Polo, 2018).

In contrast, *divergence* signals dissonance between parents' and adolescents' understanding of adolescent functioning and may reflect meaningful *inconsistencies* in problems across contexts. Adolescents reporting higher levels of problems than their parents may have a more covert and context-specific clinical presentation (i.e., outside of the home), which may be particularly the case for internalizing problems. This pattern of reporting may also occur when parents have a lower sensitivity for or awareness of what their adolescent is thinking and feeling. Previous research shows that divergent patterns of reports are associated with risk for poor outcomes. For example, LCA-based work by Lippold and colleagues (2013, 2014) found that

when parents report that they have higher knowledge about their adolescent's activities than their adolescent reports, adolescents are at increased risk for developing substance abuse problems. Conversely, youth self-reporting lower levels of anxiety concerns relative to their parent at the start of treatment portends poorer treatment outcomes (Becker-Haimes, Jensen-Doss, Birmaher, Kendall, & Ginsburg, 2018). This finding may reflect that youth not reporting mental health concerns are less likely to be engaged in treatment.

Overall, LCA-based work demonstrates that convergence and divergence patterns have distinct correlates, suggesting that these person-centered models capture meaningful assessment information that cannot be gleaned when using combinational rules. However, this analytic approach has yet to be applied to inpatient assessments of adolescent internalizing problems. This is an important gap to address in the assessment literature. Indeed, the high-stakes clinical decision-making inherent in inpatient assessments highlights the importance of developing evidence-based interpretive models for multi-informant reports collected in these settings (Friedman et al., 2011) These methods must be cost-effective and time-efficient due to resource limitations in clinical settings (Beidas et al., 2015). They also ought to be useful for informing clinical decision-making and treatment services, particularly with predicting key outcomes (e.g., length of hospital stay, inpatient readmission) (Reynolds et al., 2016, 2018). Improving interpretive models may also help resolve questions about the validity of informants' reports of internalizing problems often raised in inpatient settings. For instance, prior work shows that many adolescents report suicidal thoughts and behaviors that their parents do not (Klaus et al., 2009), while other work finds that parents at times report suicidal ideation that their children do not (Thompson et al., 2006). Concerns have long been raised about adolescents downplaying their internalizing symptoms to avoid intervention (Nock et al., 2010, Busch, Fawcett, & Jacobs,

2003) or "denying" internalizing problems, including suicidal ideation, endorsed by their parents (Jones et al., 2019). Beliefs about differences in the veracity of informants' reports may lead to assessors relying on a single informant to make clinical decisions, thus negating attempts to leverage multi-informant data and reducing the overall predictive power of the assessments. Given that person-centered interpretative models have yet to be applied in inpatient assessments of adolescent internalizing problems, it is unclear whether prior work applies in this setting, and if so, how best to leverage multi-informant reports to understand adolescents' clinical presentation and treatment course.

Current Study

Our naturalistic study applies LCA modeling techniques to examine data taken from efficient, inexpensive, and routinely collected assessments completed by a large, diverse psychiatric inpatient sample of adolescents entering inpatient care, and their parents. In turn, we test whether patterns of data extracted by these LCA models predict important clinical indices germane to inpatient care. We addressed three aims. First, we used exploratory LCA to identify classes of parent-adolescent reports of adolescent internalizing problems. We hypothesized that as in prior work (De Los Reyes et al., 2009, 2016; Lerner et al., 2017; Lippold et al., 2013, 2014; Makol & Polo, 2018), patterns of parent-adolescent reports would vary, with some dyads converging in their reports and other dyads diverging in their reports. Second, we examined the association between latent classes and baseline clinical characteristics. Consistent with prior work (De Los Reyes et al., 2016, Lerner et al., 2017; Lippold et al., 2013, 2014; Makol & Polo, 2018), we hypothesized that dyads converging in reports of high levels of adolescent internalizing problems and dyads diverging in their reports would be more likely to have an adolescent with suicidality at admission (i.e., suicidal ideation, plan, or attempt) and higher

clinician-rated impairment, relative to dyads converging in reports of low levels of adolescent problems. Third, we examined whether latent classes predicted treatment characteristics. Consistent with prior work (De Los Reyes et al., 2016; Lerner et al., 2017; Lippold et al., 2013, 2014; Makol & Polo, 2018), we hypothesized that dyads converging in reports of high levels of adolescent internalizing problems and dyads diverging in their reports would be more likely to be in seclusion and restraint, receive an anxiety or mood disorder diagnosis, exhibit comorbidity, have longer hospital stays, be readmitted to inpatient care, and receive more intensive aftercare services, relative to dyads converging in reports of low levels of adolescent problems.

Method

Participants and Procedure

Participants included 765 adolescents in psychiatric inpatient service at a large, urban, Mid-Atlantic academic medical center. The 12-bed unit services youth ages 5-17 for acute treatment and hospitalization. All adolescents on the unit had guardian consent (i.e., only voluntarily admitted patients accepted). Adolescents most often entered the medical center through the emergency department, often following an acute crisis. To be admitted to inpatient care, the pre-admission assessment determined that adolescents posed an imminent threat to themselves or others and that a restrictive environment would be most appropriate given the adolescent's level of functioning. Admissions are intended for acute stabilization including monitoring of medication and mental status. The treatment team included an attending, a child/adolescent psychiatry fellow, an adult psychiatry resident, an occupational therapist, a social worker, a psychologist, three to four nurses per shift, and two to three psychiatry assistants per shift. Adolescents and their primary caregivers completed a series of measures about the adolescent's functioning within the first 24 hours of admission. We obtained data in the present

study via retrospective chart review of consecutive admissions seen from September 2011 to December 2015. We systematically reviewed electronic medical records and extracted the specified study variables documented during the adolescent's admission. A total of 1182 adolescents were admitted to the unit during the study period. Of these adolescents, 417 were not included in analyses due to incomplete measures by parents (n = 180), adolescents (n = 123), or both informants (n = 118). All procedures, including extraction and reviewing of electronic medical record data, were approved by the Johns Hopkins University School of Medicine institutional review board.

Adolescents ranged in age from 12 to 17 years (M_{age}=14.7, SD=1.5), were 70.3% female, and identified as Black/African American (48.2%), White/European American (42.1%), Asian American/Pacific Islander (1.6%), Hispanic/Latino (1.3%), "other" (3.5%), or unknown (3.3%). Parent participants included biological mothers (77.0%), biological fathers (13.1%), adoptive/foster parents (2.9%), grandparents (3.3%), or other family guardians or stepparents (3.8%). At admission, adolescents' suicide status varied: suicidal ideation (36.2%), suicide plan (7.3%), suicide attempt (20.7%), or no suicide concerns (35.8%). At discharge, adolescents received between 1 and 10 psychiatric diagnoses ($M_{diagnoses}$=2.85, SD=1.46), and comorbidity was high (82.7%). The most common diagnoses included depressive disorders (75.2%), anxiety disorders (38.3%), attention deficit/hyperactivity disorder (ADHD) (31.4%), and substance use disorders (SUDs) (19.7%). Rates of psychiatric diagnoses in the present sample approximate rates of diagnoses in other psychiatric inpatient samples where more stringent diagnostic procedures (i.e., structured or semi-structured diagnostic interviews) were used (e.g., Esposito-Smythers, Spirito, Kahler, Hunt, & Monti, 2011; Gipson, Agarwala, Opperman, Horwitz, &

King, 2015; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Adolescents' length of stay in the unit ranged from 1 to 61 days (M_{days}=7.81, *SD*=4.89).

Measures

Internalizing problems. Parents and adolescents provided reports of adolescent internalizing problems on the Behavioral Assessment System for Children (BASC; Reynolds & Kamphaus, 2004), a widely-used measure of youth emotional and behavioral problems. The reliability and validity of the BASC is well supported, including among adolescents and their parents in psychiatric inpatient settings (Prinstein et al., 2008; Esposito-Smythers et al., 2011; Prinstein, Nock, Spirito, & Grapentine, 2001). In the present study, we identified adolescents with clinically significant internalizing problems (i.e., anxiety, depression, somatization) using gender and age normed T-scores (i.e., ≥ 70) (Reynolds & Kamphaus, 2014).

Baseline clinical characteristics. We coded baseline clinical characteristics from the electronic medical record. We created a dichotomized variable for adolescent suicide status at admission (none vs. ideation/plan/attempt), which was coded based on an intake completed at admission to the inpatient unit collecting information from both the adolescent and parent and the medical record (i.e., notes from the emergency department). We also collected clinician-rated impairment, which was rated by the psychiatry resident or fellow at intake using the Children's Global Assessment Scale (CGAS; Shaffer et al., 1983). Scores on the CGAS range from 1 (*the most impaired level*) to 100 (*superior level of functioning*).

Treatment characteristics. We coded several characteristics of the treatment received by adolescents. Psychiatric nurses charted use of seclusion and medication during the adolescent's stay. We coded dichotomous variables (yes vs. no) indicating whether there was any use of pro re nata (PRN) medications for aggression, standing antipsychotics, and locked door

seclusion. In collaboration with the attending physician, psychiatric fellow/residents assigned diagnoses at discharge. To form diagnoses, physicians collected information that became available to them over the course of adolescents' stay, including informants' reports on various symptom measures, the adolescent's medical history, observation, response to medication and intervention while on the unit, and clinical interviews. We coded a variable indicating whether adolescents met criteria for an anxiety disorder (yes vs. no), depressive disorder (yes vs. no), and any comorbid conditions (one diagnosis vs. two or more diagnoses). We also coded variables indicating the adolescent's length of stay (number of days from admission to discharge), aftercare services (outpatient vs. partial hospitalization or care in another restrictive environment [i.e., residential treatment, therapeutic foster home, or other inpatient]), and readmission to the psychiatric inpatient unit within two months (yes vs. no).

Data Analytic Plan

Classes of parent-adolescent reports. We evaluated our first aim using exploratory LCA on parent-adolescent reports of internalizing problems (anxiety, depression, somatization). This analysis uses categorical or ordinal variables to identify classes in which there is local independence of indicators and can be used to determine whether qualitatively distinct subgroups of participants exist based on similar patterns of indicator variables. For use in LCA, we dichotomized each informant's reports on the BASC internalizing scales using the clinically significant T-score cutoff (i.e., 0=below clinical threshold, 1=at or above clinical threshold). This approach is consistent with prior research using LCA to address similar aims (De Los Reyes et al., 2016; Makol & Polo, 2018). We entered the six dichotomized parent-adolescent internalizing scale reports into an LCA model using Mplus Version 7.1 (Muthén & Muthén, 2013).

We tested one- through five-class solutions using five evaluation fit criteria. First, in keeping with model fit procedures described in prior work in the multi-informant literature (De Los Reyes et al., 2013), we examined the statistical significance of the Pearson and Likelihood Ratio Chi-Square tests of model fit with the addition of each class. The process began by assessing the fit of a one-class solution, and continued sequentially with the addition of one class until the chi-square statistic was no longer significant, indicating that the classes providing the best fit to the data have been identified. In addition, we evaluated a series of model fit indices for each class including: Bayesian Information Criterion (BIC), Sample Size Adjusted BIC (Adj. BIC), and Akaike Information Criterion (AIC) (Burnham & Anderson, 2004); Bootstrapped Lo-Mendell Rubin Likelihood Ratio (BLMR-LR) (Nylund, Asparouhov, & Muthén, 2007); and entropy index (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993). After using fit indices to identify the number of classes providing the best fit to the data, we examined estimated probabilities of class membership for the final LCA solution using Nagin's (2006) 0.70 cutoff. Using the final LCA solution and one-way ANOVA analyses, we also tested between-class mean differences on the continuous parent and adolescent internalizing problem reports from which we derived discrete indices for use in our LCA models.

Examining the clinical utility of reporting patterns. Prior to conducting analyses in reference to specific hypotheses, we first conducted exploratory chi-square and ANOVA analyses to determine whether there were significant differences in adolescent demographic characteristics (i.e., age, gender, ethnicity) across baseline and treatment characteristics (i.e., our criterion variables). For chi-square tests, we calculated the Cramer's *V* statistic. Given the exploratory nature of these tests and the large number of tests conducted, we applied a

Bonferroni correction. We controlled for any demographic variables significantly associated with baseline and treatment characteristics in subsequent analyses.

To examine whether reporting patterns were associated with suicide status at admission, we conducted a binomial logistic regression analysis with LCA classes as the independent variable and suicide status at admission (0=no suicidality, 1=suicide ideation, plan, or attempt) as the dependent variable. In this analysis, we entered parent-adolescent dyads with low levels of reports of internalizing problems as the reference group in comparison to all other patterns of reports. To examine whether clinician-rated impairment varied across reporting patterns, we conducted a one-way ANOVA with LCA classes as the independent variable and clinician-rated impairment as the dependent variable. We conducted post hoc comparisons of significant ANOVA analyses using the Least Significant Difference (LSD) test.

To examine whether reporting classes predicted treatment characteristics, we conducted binomial logistic regression analyses with LCA classes as the independent variable and categorical treatment characteristics as dependent variables. We dummy coded treatment characteristics for the purpose of regression analyses: locked door seclusion use (0=no use, 1=use), PRN medication use for aggression (0=no use, 1=use), standing antipsychotic use (0=no use, 1=use), anxiety disorder diagnosis (0= no diagnosis, 1= diagnosis), depressive disorder diagnosis (0=no diagnosis, 1= diagnosis), comorbidity (0=no comorbidity, 1=comorbidity), psychiatric inpatient readmission within two months (0=no readmission, 1=readmission), and aftercare (0=outpatient, 1=partial hospitalization or other restrictive environment). In all regressions, we entered parent-adolescent dyads with low levels of reports of internalizing problems as the reference group in comparison to all other patterns of reports. To examine

whether length of stay varied across reporting patterns, we conducted a one-way ANOVA with LCA classes as the independent variable and length of hospital stay as the dependent variable.

For tests of our main hypotheses, we inferred statistical significance of findings using two-tailed tests and a *p*-value threshold of <.05. Unlike the exploratory comparisons between baseline and treatment characteristics and demographic variables described previously, we did not apply Bonferroni corrections to planned analyses in reference to specific hypotheses (i.e., tests examining the association between LCA classes and baseline and treatment characteristics). This decision is in line with recommendations on judicious use of Bonferroni corrections (e.g., Armstrong, 2014; Perneger, 1998; Streiner & Norman, 2011). We inferred magnitudes of effect sizes using Cohen's (1988) effect size conventions for *r* (small: .10; medium: .30; large: .50) and *d* (small: .30; moderate: .50; large .80). We report odds ratios (OR) for all significant binomial logistic regression analyses, namely for comparisons between LCA classes.

Results

Preliminary Analyses

We computed bivariate correlations to examine relations among parent-adolescent reports on the BASC internalizing scales. As reported in Table 1, we observed small-to-moderate correlations between informant reports (i.e., *r*s ranging from .09 to .32), including when informants rated the same adolescent internalizing subscale (i.e., *r*s ranging from .20 to .32).

Classes of Parent-Adolescent Reports

We report main findings of our exploratory LCA in Table 2. The four-class solution yielded non-significant chi-square test results, indicating good model fit to the data. For a four-class solution, we observed maximal model parsimony based on the BIC, Adj-BIC and AIC, and maximal accuracy in assigning dyads to their respective classes based on the entropy index.

Using the BLMR-LR, we also observed that the addition of a two-, three-, and four-class solution provided better fit to the data than a solution with one fewer class. Given that all model fit indices suggested that the four-class solution provided the best fit to the data, we retained the four-class solution. Finally, supporting the use of a four-class solution, the mean assignment probably for the four classes (0.86) was well above Nagin's (2006) 0.70 cutoff. Figure 1 shows a graphical depiction of the four-class solution. Additional descriptive statistics for the LCA solution are available from the first author.

Consistent with hypotheses, classes varied in their patterns of parent-adolescent reports of internalizing problems. As a general rule, when an informant's reports of adolescent internalizing problems in a given class had a 50% or higher likelihood of endorsement at clinically significant levels, we considered this reporting to be "high." In contrast, when an informant's reports of adolescent internalizing problems had a less than 50% likelihood of endorsement at clinically significant levels, this reporting was considered "low." Four distinct patterns of reports emerged: (1) Parent-Adolescent Low (LL; *n*=375; 49.0%), (2) Parent Low-Adolescent High (PL-AH; *n*=88; 11.5%), (3) Parent High-Adolescent Low (PH-AL; *n*=167; 21.8%), (4) Parent-Adolescent High (HH; *n*=135; 17.6%). Thus, two classes were characterized by convergence in reports of internalizing problems (i.e., LL, HH), and two classes were characterized by divergence in reports (i.e., PL-AH, PH-AL). Interestingly, when informants were in a "high" reporting group, they were likely to report clinical levels of anxiety and depression. In contrast, parents and adolescents were relatively less likely to endorse clinical levels of somatic symptoms, even when in the "high" reporting group.

Using ANOVA analyses, we also tested between-class mean differences on the continuous parent and adolescent internalizing problem reports from which we derived discrete

indicators for use in our LCA models. We consistently observed mean differences in the directions reflected by classes observed in our LCA model (see Table 3). Specifically, representing large effects, the HH class consistently scored higher than the LL class on all indicators across informants, parent-reported indicators mean d=1.45; adolescent-reported indicators mean d=1.98. Conversely, representing large effects, the PH-AL class scored higher than the PL-AH class on all parent-reported indicators, mean d=1.54. Further, representing large effects, the PL-AH class scored higher than the PH-AL class on all adolescent-reported indicators, mean d=1.43. In sum, direct tests of the continuous data from informants' reports corroborated the patterns of classes observed in our LCA models. That is, though based on discrete indicators, patterns observed in our 4-class LCA model solution validly reflected the underlying continuous data from which we derived these indicators.

Examining the Clinical Utility of Reporting Patterns

We first used chi-square and ANOVA analyses to determine whether there were significant differences in adolescent demographic characteristics (i.e., age, gender, ethnicity) across baseline clinical and treatment characteristics. Given the exploratory nature of these tests, we applied a Bonferroni correction (i.e., 33 tests and thus a corrected p value of .002) and observed significant relations between gender and suicide status at admission ($\chi^2(3)=46.35$, $p<.001$; Cramer's $V=.25$, $p< .001$), depressive disorder diagnosis ($\chi^2(1)=27.49$, $p<.001$; Cramer's $V=.19$, $p< .001$), and standing antipsychotic administration ($\chi^2(1)=20.78$, $p<.001$; Cramer's $V=.17$, $p< .001$); and ethnicity and anxiety disorder diagnosis ($\chi^2(4)=27.17$, $p<.001$; Cramer's

V=.19, p< .001).[1] Thus, we controlled for these demographic characteristics in analyses examining the relation between LCA classes and baseline clinical and treatment characteristics.

Baseline clinical characteristics. We conducted a binary logistic regression analysis to examine whether LCA classes (reference group=LL class) were associated with suicide status at admission. Controlling for gender, LCA classes were associated with suicide status at admission, ($\chi^2(3)=14.66$, $p<.01$). Relative to adolescents in the LL class, adolescents in the PH-AL (OR=1.61, $p<.05$) and PL-AH (OR=2.61, $p<.01$) classes were more likely to exhibit suicidality at admission. We found no significant differences in odds of being admitted for suicidality between the HH and LL classes (OR=1.33, p=.19).

We conducted a one-way ANOVA to determine whether clinician-rated impairment was significantly different across LCA classes. We did not find a significant relation between LCA classes and clinician-rated impairment, $F(3, 711)=.79$, p=.50.[2]

Treatment characteristics. We used binomial logistic regression analyses to examine whether LCA classes predicted treatment characteristics. In all regression analyses, the LL class served as the reference group in comparisons among classes. Binomial logistic regression analyses revealed that LCA classes were predictive of locked door seclusion use, ($\chi^2(3)=11.34$, $p<.05$). Relative to adolescents in the LL class, adolescents in the PH-AL class were more likely to receive locked door seclusion (OR=12.26, $p<.05$). We found no significant difference in odds

[1]Specifically, girls were more likely than boys to exhibit suicidality at admission, receive a depressive disorder diagnosis, and receive standing antipsychotics during treatment. European American participants were more likely to be diagnosed with an anxiety disorder and African American participants were less likely to be diagnosed with an anxiety disorder.
[2]When controlling for the number of externalizing diagnoses (i.e., ADHD, SUDs, Conduct Disorder [CD], Oppositional Defiant Disorder [ODD], Disruptive Behavior Disorder [DBD]) adolescents met criteria for, the same pattern of findings emerged including all significant associations between LCA classes and baseline clinical characteristics.

of locked door seclusion between the LL class and HH (OR=6.38, p=.10) or PL-AH (OR=6.76, p=.06) classes. Controlling for gender, LCA classes were predictive of standing antipsychotic use, ($\chi^2(3)=12.72$, $p<.01$). Relative to adolescents in the LL class, adolescents in the PH-AL (OR=1.79, $p<.05$) and HH (OR=2.19, $p<.01$) classes had higher odds of receiving standing antipsychotics. We found no significant difference in odds of receiving standing antipsychotics for adolescents in the LL and PL-AH classes (OR=1.20, p=.58). We found that LCA classes were not predictive of PRN medication administration for aggression, ($\chi^2(3)=3.60$, p=.31).

Controlling for ethnicity, LCA classes were associated with anxiety disorder diagnosis, ($\chi^2(3)=39.22$, $p<.001$). Relative to adolescents in the LL class, adolescents in the HH (OR=3.37, $p<.001$), PH-AL (OR=1.50, $p<.05$), and PL-AH (OR=2.57, $p<.001$) classes were more likely to receive an anxiety disorder diagnosis. Controlling for gender, LCA classes were not associated with depressive disorder diagnosis, ($\chi^2(3)=6.17$, p=.10). In addition, LCA classes were not associated with comorbidity, ($\chi^2(3)=6.10$, p=.11).

LCA classes were predictive of adolescents' aftercare ($\chi^2(3)=10.89$, $p<.05$). Relative to receiving outpatient care, adolescents had higher odds of receiving partial hospitalization or care in another restrictive environment when in the HH (OR=1.70, $p<.05$), PH-AL (OR=1.70, $p<.01$), and PL-AH (OR=1.66, $p<.05$) classes, relative to the LL class. We found that LCA classes were not predictive of psychiatric inpatient readmission at two months ($\chi^2(3)=3.51$, p=.32).

We conducted a one-way ANOVA to determine whether length of stay was significantly different across LCA classes. We observed a significant relation between LCA classes and length of hospital stay, $F(3, 761)=3.69$, $p<.05$. Post hoc comparisons using the LSD test revealed that adolescents in the HH class (M=8.70, SD=4.70) had longer hospital stays on average than adolescents in the LL class (M=7.25, SD=4.99), $p<.01$. This represented a small effect, d=.30. In

contrast, there were no significant differences in length of hospital stay between adolescents in the HH class and the PH-AL class (M=8.10, SD=4.12), p=.29, d=.14, or PL-AH class (M=8.31, SD=5.83), p=.55, d=.07. There were also no significant differences in length of hospital stay between adolescents in the LL class and the PH-AL class, p=.06, d=.19, or PL-AH class, p=.07, d=.19, or between the PH-AL and PL-AH classes, p=.75, d=.04.[3]

Discussion

In our naturalistic study, we took a theoretically grounded approach that leveraged the latest person-centered analytic tools to integrate multi-informant reports of adolescent internalizing problems taken using efficient and low-cost surveys. We examined LCA-based patterns of parent-adolescent reports on these surveys within a clinically and demographically diverse psychiatric inpatient sample. We made three important findings. First, as in prior work (De Los Reyes et al., 2009, 2016; Lerner et al., 2017; Lippold et al., 2013, 2014; Makol & Polo, 2018), we found that despite overall low levels of convergence between parent-adolescent reports of adolescent internalizing problems, dyads displayed individual differences in reporting patterns characterized by *convergence* (i.e., LL, HH) or *divergence* (i.e., PH-AL, PL-AH) between reports. Surprisingly, the largest pattern of reporting was characterized by convergence in informants' reports of low levels of internalizing problems. However, it is important to note that our clinically diverse sample was not limited to youth with internalizing problems and that "clinically significant" endorsement of internalizing problems was determined using stringent BASC cutoffs (i.e., T-scores ≥ 70).

[3]When controlling for the number of externalizing diagnoses (i.e., ADHD, SUDs, CD, ODD, DBD) adolescents met criteria for, the same pattern of findings emerged including all significant associations between LCA classes and treatment characteristics.

Second, we examined whether reporting patterns differentially related to baseline clinical characteristics important for understanding adolescents' clinical presentation. Relative to LL adolescents, PH-AL and PL-AH adolescents were more likely to exhibit suicidality at admission, while there were no differences in suicidality between the HH and LL classes. We did not observe differences in clinician-rated impairment across patterns of informant reports. Third, parent-adolescent reporting patterns differentially predicted hospitalization outcomes. Specifically, HH and PH-AL adolescents were more likely than LL adolescents to receive standing antipsychotics, although we found no differences in PRN medication use for aggression across reporting patterns. In addition, relative to LL adolescents, all other reporting patterns were more likely to receive an anxiety disorder diagnosis, although there were no differences in depression diagnosis or comorbidity across reporting patterns. Although HH adolescents had longer hospital stays on average compared to LL adolescents, reporting patterns were not predictive of inpatient readmission. Finally, relative to outpatient care, HH, PH-AL, and PL-AH adolescents were more likely than LL adolescents to receive more intensive aftercare services (e.g., partial hospitalization). Our findings have important implications for assessment and clinical decision-making when working with hospitalized adolescents, as well as broader implications for research and clinical work leveraging a multi-informant assessment battery.

Overall, our findings support the clinical utility of leveraging multi-informant reports in inpatient settings. Using LCA, we demonstrated that patterns of multi-informant reports can reliably be identified in inpatient care and that these patterns are associated with important clinical indices. This advances prior work on strategies for integrating multi-informant reports, such as combinational rules (e.g., "OR" and "AND" rules) (Bird et al., 1992; Jensen et al., 1999; Piacentini, et al., 1992), which have limited empirical support for clinical utility (De Los Reyes

et al., 2015). Our findings have two important implications relevant to use of these integrative strategies. First, clinically useful information can be obtained through examination of specific patterns of multi-informant reports, including the nature of convergence and divergence between informants (e.g., adolescents reporting higher levels of symptoms than parents vs. adolescents reporting lower levels of symptoms than parents). Specifically, patterns of informants' reports *reflect* clinically useful information including the manifestation of behavior across contexts (e.g., manifestation of anxiety across home and school settings), crucial processes relevant to psychopathology (e.g., parent-adolescent communication), and/or crucial aspects of the adolescent's environment (e.g., demands placed on adolescents across contexts) (De Los Reyes et al., 2015). Second, our findings provide support for use of *both* adolescent and parent reports, as opposed to systematic use of one particular informant's reports. That is, our findings point to the idea that no single informant's reports provide all of the information necessary for predicting important clinical outcomes. In many cases (i.e., PH-AL, PL-AH), predictive utility came from understanding not only who provided the relatively high reports but also who provided the relatively low reports. This is an important finding given that, as mentioned previously, existing combinational algorithms like "AND" and "OR" rules do not preserve information about the source or informant endorsing concerns. Further and in light of repeated concerns about the veracity of adolescent reports collected in inpatient settings (Nock et al., 2010; Busch et al., 2003), it is important to highlight that many of our findings point to divergence between a specific informant *relative to* another specific informant as uniquely predictive of meaningful clinical indices. By construction, each pattern of reports *required* the adolescent's report to understand the nature of internalizing problems and predict important outcomes. If the adolescent's report (or the parent's report) was of no value, not only would we have failed to

identify a coherent or suitable LCA model solution, but the LCA classes contained in the solution would fail to yield the important predictions we observed. Future work should continue to examine specific patterns of multi-informant reports to advance the literature beyond systematic use of only one informant's reports or widely used combinational algorithms like "AND" and "OR" rules.

Consistent with prior work (De Los Reyes et al., 2009; Lerner et al., 2017), when dyads *converged* in reports of elevated internalizing problems, we found some evidence that this pattern indicated greater severity of adolescent mental health concerns and more intensive treatment. Specifically, HH adolescents had the highest likelihood of meeting criteria for an anxiety disorder, suggesting that informants converging in reports of elevated internalizing concerns may signal greater severity, consistency, and observability of these problems (De Los Reyes & Ohannessian, 2016). However, we found that when any informant endorsed elevated internalizing problems, adolescents were more likely to meet criteria for an anxiety disorder. HH adolescents were not more likely to exhibit suicidality at admission, which may suggest that adolescents agreeing with their parents in reports of elevated internalizing problems are at reduced risk for suicidality. Regarding treatment, HH adolescents were over two times more likely to receive standing antipsychotics and, on average, have longer hospital stays. Given that hospitalization is one of the most expensive and intensive forms of mental health care (James et al., 2010), there has been a recent push to reduce health care costs, seclusion/restraints, and length of hospital stays (Reynolds et al., 2018). Evaluating patterns of parent-adolescent reports at intake may aid practitioners in making predictions about those adolescents needing longer and more intensive inpatient care, perhaps changing the treatment approach early on to reduce use of seclusion/restraints and length of stay. Regarding aftercare, relative to LL adolescents, all

patterns of reporting including elevated internalizing problem reports were over 1.5 times more likely to be referred for partial or full hospitalization, which may indicate that when either parents or adolescents report elevated levels of internalizing concerns, more intensive aftercare is indicated.

Examining patterns of *divergence* in parent-adolescent reports yielded some similar and other unique findings. That is, we found some evidence that divergence indicated greater severity of adolescent mental health concerns and more intensive treatment. First, for a substantial subset of dyads (i.e., PL-AH group), adolescents alone reported elevated internalizing problems. When assessing adolescent internalizing problems, it may be particularly important to pay attention to this pattern of reporting given that internalizing problems are relatively covert and adolescents provide incrementally valid reports of these problems (Deros et al., 2018). Psychoeducation about internalizing problems may be particularly important for PL-AH families. For another substantial subset of dyads (i.e., PH-AL group), parents alone reported elevated levels of internalizing problems. For adolescents in dyads who reported lower problems relative to parent reports, this reporting pattern may reflect a baseline disengagement in or resistance to inpatient care. As evidence of this, compared to LL adolescents, PH-AL adolescents were over twelve times more likely to receive locked door seclusion and over 1.5 times more likely to receive standing antipsychotics. Of note, HH and PH-AL adolescents were both more likely to receive standing antipsychotics. This findings may stem in part from the need for parental consent for adolescents to receive medication; that is, parents endorsing elevated internalizing problems may be more likely to support administration of antipsychotics.

We found that PH-AL adolescents were over 1.5 times more likely to exhibit suicidality at admission and meet criteria for an anxiety disorder, relative to LL adolescents. Rates of

suicidality and anxiety disorders were even higher among PL-AH adolescents; we found that PL-AH adolescents were over 2.5 times more likely exhibit suicidality at admission and to meet criteria for an anxiety disorder, relative to LL adolescents. The finding regarding suicide status at admission may indicate that divergence in parent-adolescent perceptions, and not convergence in reports of high levels of problems, may be particularly associated with suicidality. On the one hand, it may be that PL-AH adolescents have significant internalizing concerns and SIB that go unrecognized by their parents and are thus at heightened risk of being hospitalized due to parents' lack of knowledge about their internalizing distress (Jones et al., 2019). Indeed, parents are "gatekeepers" to mental health services, and are unlikely to initiate treatment if not observing clinically significant symptoms. Prior work supports that many parents are often unaware of their adolescent's depressive symptoms and suicidal ideation, and that a lack of parental endorsement is associated with a decreased likelihood that adolescents receive needed mental health services (Jones et al., 2019; Makol & Polo, 2018). On the other hand, PH-AL adolescents may be less likely to disclose to their parents that they experience internalizing distress and suicidal thoughts due to avoidance of intervention. If true, then PH-AL adolescents may be at heightened risk for poor outcomes (e.g., increased SIB) (Nock et al., 2010), in part, because lack of knowledge of their concerns may result in the parent having difficulty engaging their child in treatment. The dissonance in reporting of internalizing distress could also reflect poor family cohesion or dysfunctional parent-adolescent communication, which increases risk for SIB (Brent et al., 2009). In sum, *dissonance* in parent-adolescent understanding of the adolescent's internalizing concerns is associated with suicidality. Our findings indicate that reporting patterns in either direction (i.e., PL-AH and PH-AL) should be monitored closely during hospitalization and that these families would likely benefit from psychoeducation about adolescent suicide risk. Given

that suicide is a pressing public health concern in this age group (Sullivan et al., 2015), future work should continue to characterize patterns of parent-adolescent reports associated with suicidality.

Some baseline clinical and treatment characteristics did not relate to patterns of reporting. Inconsistent with prior work (Lerner et al., 2017), clinician-rated impairment did not differ across classes, including for HH dyads. This suggests that among hospitalized adolescents, patterns of reports of internalizing problems alone do not differentiate adolescents on impairment. However, this finding may also be due to the high levels of impairment observed across our sample of hospitalized adolescents, leading to range restriction. Use of PRN medications for aggression also did not differ across classes. This may indicate that patterns of reports of internalizing problems are poor predictors of PRN medications for aggression, which are utilized more for externalizing behaviors (e.g., aggression, property destruction). Finally, reporting patterns did not predict depression diagnosis or comorbidity at discharge, which may also be due to the high rates of depression and comorbidity in our clinically severe sample of hospitalized adolescents. Further, large differences in rates of depression emerge in adolescence (Merikangas et al., 2010) and we found that gender was associated with depression diagnosis in our sample. For this reason, we controlled for gender when examining the association between reporting patterns and depression diagnosis. When not controlling for gender, LCA classes were predictive of depression diagnosis.

Study results should be interpreted in the context of study limitations. First, LCA models were based on dichotomized BASC scores using clinical significance cutoffs. However, continuous BASC scores within each latent class were consistent with the pattern of relatively high or low levels for each BASC internalizing subscale, providing a strong rationale for using

dichotomous scores. Second, adolescent diagnoses were formed, on average, after eight days of inpatient treatment and were not obtained using structured diagnostic interviews. As mentioned previously, this clinical diagnostic approach yielded rates of diagnoses comparable with those observed in prior work within inpatient samples that used more stringent diagnostic procedures (i.e., structured and semi-structured interviews; Esposito-Smythers et al., 2011; Gipson et al., 2015; Nock et al., 2006). At the same time, we encourage future research focused on replicating and extending our findings to do so using standardized diagnostic procedures. Relatedly, given that physicians in the present study had access to BASC reports, in addition to other measures, future work should examine our research questions in a sample in which clinicians are masked to multi-informant reports. Third, we were unable to examine whether patterns of informants' reports were associated with treatment outcomes and whether clinician access to multi-informant reporting patterns improves prognosis. Consistent with prior work (Becker-Haimes et al., 2018), patterns of informants' reports may predict the extent to which treatment is effective in reducing symptoms and impairment. In addition, determining the treatment utility of multi-informant reporting patterns can aid in determining whether presenting patterns of reports to clinicians improves decision-making and outcomes in psychiatric inpatient care. Notwithstanding these limitations, the present study advances the literature on use of multi-informant reports in psychiatric inpatient settings, and has important implications for assessment and clinical decision-making. Further, the naturalistic design of our study and use of a clinically and demographically diverse sample of adolescents supports the generalizability of findings to applied clinical settings, as well as opens the door to further inquiry into the clinical utility of multi-informant reports.

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Table 1

Correlations among Parent and Adolescent Reports of Adolescent Internalizing Problems on the BASC (n=765)

Variable	**1**	**2**	**3**	**4**	**5**	**6**	***M***	***SD***
1 Parent, Anxiety	-	.56***	.43***	.32***	.16***	.22***	60.89	14.26
2 Parent, Depression		-	.44***	.18***	.20***	.11**	77.06	16.98
3 Parent, Somatization			-	.20***	.09*	.31***	59.37	14.43
4 Adolescent, Anxiety				-	.67***	.53***	60.12	13.49
5 Adolescent, Depression					-	.41***	64.87	14.68
6 Adolescent, Somatization						-	55.93	12.83

Note. **BASC**=Behavioral Assessment System for Children. Boxes denote correlations between parent-adolescent reports for the same BASC internalizing subscale.

*p<.05; **p<.01; ***p<.001.

Table 2.

Model Fit Indices for One to Five Class Solutions for Parent and Adolescent Reports of Internalizing Problems (n=765)

	BIC	Adj. BIC	AIC	BLMR-LR	Entropy	Pearson χ^2	Likelihood Ratio χ^2
1 class	5367.41	5348.36	5339.57	n/a	n/a	672.61***	467.43***
2 classes	5085.37	5044.09	5025.06	321.60*	0.61	278.84***	224.58***
3 classes	4997.94	4934.43	4905.14	131.10***	0.74	99.06***	90.66***
4 classes	**4991.29**	**4905.56**	**4866.02**	**52.00*** **	**0.75**	**49.67**	**37.54**
5 classes	5028.32	4920.35	4870.56	7.69	0.63	28.48	28.08

Note. **BIC**=Bayesian Information Criterion; **Adj. BIC**=Sample Size Adjusted Bayesian Information Criterion; **AIC**=Akaike Information Criterion; **BLMR-LR**=Bootstrapped Lo-Mendell Rubin Likelihood Ratio.

*p<.05, **p<.01, ***p<.001.

Table 3

Means and Standard Deviations for Parent and Adolescent Reports of BASC Internalizing Problems Across Latent Classes (n=765)

BASC Reports	**LL**	**PL-AH**	**PH-AL**	**HH**	*Omnibus Contrasts*	*Univariate Contrasts across Internalizing Problems*
			Parent Report			
Anxiety	53.25 (9.73)	56.55 (9.44)	71.23 (12.48)	72.01 (14.50)	$F(3,756)=150.51$***	
Depression	69.06 (13.51)	65.41 (12.14)	90.95 (12.75)	89.47 (13.12)	$F(3,758)=171.57$***	LL < HH; PL-AH < PH-AL
Somatization	52.49 (9.46)	55.22 (8.80)	69.92 (14.30)	68.1 (16.59)	$F(3,760)=109.78$***	
BASC Reports	**LL**	**PL-AH**	**PH-AL**	**HH**	*Omnibus Contrasts*	*Univariate Contrasts across Internalizing Problems*
			Adolescent Report			
Anxiety	52.46 (9.78)	74.94 (6.68)	55.77 (8.70)	76.98 (5.34)	$F(3,759)=374.83$***	
Depression	58.75 (12.89)	75.53 (11.42)	62.10 (13.06)	78.16 (10.07)	$F(3,756)=107.76$***	LL < HH; PL-AH > PH-AL
Somatization	50.30 (9.75)	66.78 (12.96)	57.17 (13.12)	62.77 (11.59)	$F(3,757)=75.17$***	

Note. **BASC**= Behavioral Assessment System for Children; **LL**= Parent-Adolescent Low; **PL-AH**=Parent Low-Adolescent High; **PH-AL**=Parent High-Adolescent Low; **HH**=Parent-Adolescent High. All omnibus tests based on one-way ANOVA analyses. Univariate contrasts deemed significant if $p<.05$. For each informant, univariate contrasts were consistent across BASC internalizing problem reports.

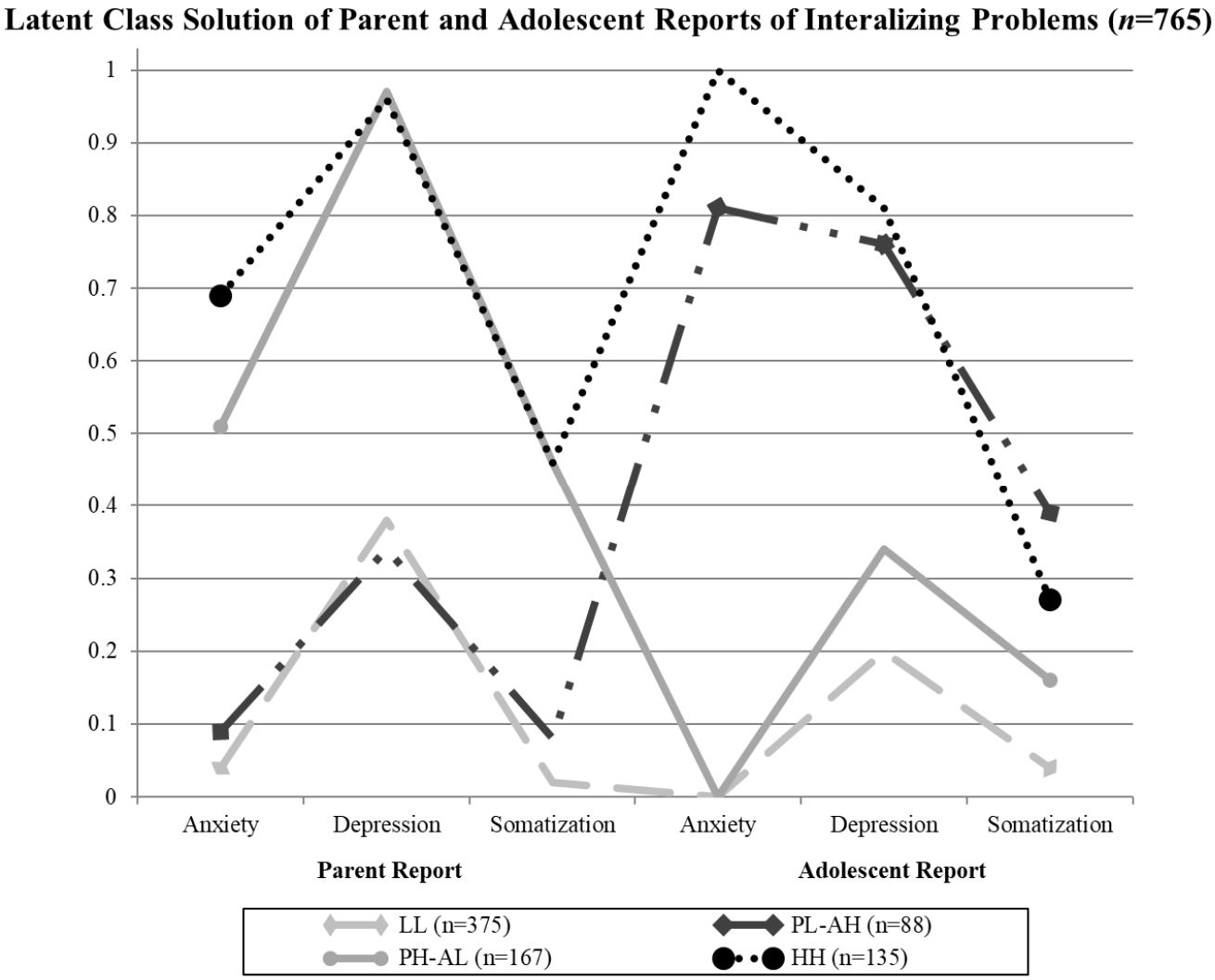

Figure 1. Graphical depiction of latent class solution of parent and adolescent reports of adolescent internalizing problems. The x-axis denotes parent and adolescent internalizing problem reports, and the y-axis denotes the probability that informants reported clinically significant levels of internalizing problems. **LL**= Parent-Adolescent Low; **PL-AH**=Parent Low-Adolescent High; **PH-AL**=Parent High-Adolescent Low; **HH**=Parent-Adolescent High.