Vanderbilt University is home to the Vanderbilt University (VU) Learning Disabilities Hub, which is funded by a grant award from the Eunice Kennedy Shriver National Institute for Child Health and Human Development (2 P20HD075443). The purpose of the VU Learning Disabilities Hub is to increase understanding about connections among math problem solving, reading comprehension, and language comprehension affect learning disabilities.

**Research Papers**
The Vanderbilt University Learning Disabilities Hub is funded by Grant # 2 P20HD075443 from the Eunice Kennedy Shriver National Institute for Child Health and Human Development to Vanderbilt University.

**Overview of the Vanderbilt LD Hub**
Despite important advances in learning disabilities (LD) intervention, the dominant intervention approach—direct skills instruction—fails to meet the needs of many students. Therefore, innovative approaches are needed to target the specific needs of subgroups of students with LD (i.e., LD subtypes) to expand the framework for LD intervention.

This Project addresses a subset of the LD population that has been understudied. This population experiences disproportionately poor response to intervention and has a distinctive set of needs. These students have difficulty in math problem solving and reading comprehension.

With this understudied population, a transdisciplinary team of researchers investigates an innovative approach to LD intervention on math problem solving. This approach involves embedding tutoring on language comprehension in the same academic material that is used for direct skills math problem-solving intervention and the same academic material that is used for direct skills reading comprehension intervention, with scaffolding that occurs in parallel ways across domains. The key questions are whether transfer across domains will occur, such that math problem solving intervention improves reading comprehension outcomes and vice versa and whether language comprehension improvement mediates effects. Also, in exploratory fashion, we examine the robustness of effects to see if they apply across boys and girls and across native English speakers and non-native English speakers.

This LD Hub has the potential impact science by increasing understanding about this LD subtype (with combined reading comprehension and math problem-solving difficulty) as an LD subtyping framework and about the role of language comprehension in math problem-solving, reading comprehension, and comorbidity. The Project has the potential to impact clinical practice by testing the viability of this LD subtype as a framework to differentiate instruction, via a novel intervention, and thereby meet the needs of a greater proportion of students with LD.

**What This Link Provides**
This link provides information on the Vanderbilt LD Hub’s research papers, as well as other Vanderbilt papers related to the topic of the LD Hub. This link also provides information about procedures for database usage.
Calculation intervention should include a focus on working memory, language comprehension, and initial calculation skill predicted the calculation outcome. Across both intervention groups and the control group, attentive behavior predicted calculation and word-processing. Findings suggest that beyond arithmetic processing, targeting executive attention, language, or the interplay between them may be promising avenues of math problem-solving intervention.

We identified child-level predictors of responsiveness to 2 types of mathematics (calculation and word-problem) intervention among 2nd-grade children with mathematics difficulty. Participants were 250 children in 107 classrooms in 23 schools pretested on mathematics and general cognitive measures and posttested on mathematics measures. We assigned classrooms randomly assigned to calculation intervention, word-problem intervention, or business-as-usual control. Intervention lasted 17 weeks. Path analyses indicated that scores on working memory and language comprehension assessments moderated responsiveness to calculation intervention. No moderators were identified for responsiveness to word-problem intervention. Across both intervention groups and the control group, attentive behavior predicted both outcomes. Initial calculation skill predicted the calculation outcome, and initial language comprehension predicted word-problem outcomes. These results indicate that screening for calculation intervention should include a focus on working memory, language comprehension,
attentive behavior, and calculations. Screening for word-problem intervention should focus on attentive behavior and word problems.


In this longitudinal study, we examined the relation between primary grade (K–2) Spanish and English language- and word-based skills and later English reading comprehension (RC) outcomes (grades 5 and 8) among 148 children from immigrant, Spanish-speaking, low-income homes in English instructional contexts since kindergarten entry. As expected, early skills, especially those in English, contributed to later RC outcomes. Most uniquely, we identified a developmental shift in the contribution of language-and word-based skills on students’ RC outcomes. Specifically, word-based skills were consistently predictive of grade 5 RC outcomes, whereas the contribution of language-based skills emerged for grade 8 RC outcomes. Finally, we also found that the relation between early skills and later RC outcomes varied depending on students’ RC levels. These results underscore the increasingly important role that early language-based skills play for later English reading comprehension outcomes, and we discuss theoretical and practical implications of this work.


The relation between 2 forms of mathematical cognition, calculations and word problems, was examined. Across grades 2-3, performance of 328 children (mean starting age 7.63 [SD=0.43]) was assessed 3 times. Comparison of a priori latent change score models indicated a dual change model, with consistently positive but slowing growth, described development in each domain better than a constant or proportional change model. The bivariate model including change models for both calculations and word problems indicated prior calculation performance and change were not predictors of subsequent word-problem change, and prior word-problem performance and change were not predictors of subsequent calculation change. Results were comparable for boys versus girls. The bivariate model, along with correlations among intercepts and slopes, suggest calculation and word-problem development are related, but through an external set of overlapping factors. Exploratory supplemental analyses corroborate findings and provide direction for future study.


The development of math skills is a critical component of early education and a strong indicator of later school and economic success. Recent research utilizing population-normed, standardized measures of math achievement suggest that structural and functional integrity of parietal regions, especially the intraparietal sulcus, are closely related to the development of math skills. However, it is unknown how these findings relate to in-school math learning. The present study is the first to address this issue by investigating the relationship between regional differences in grey matter (GM) volume and performance in grade-level mathematics as measured by a state-wide, school-based test of math achievement (TCAP math) in children from 3rd to 8th grade. Results show that increased GM volume in the bilateral hippocampal formation and the right inferior frontal gyrus, regions associated with learning and memory, is associated with higher TCAP math scores. Secondary analyses revealed that GM volume in the left angular gyrus had a stronger relationship to TCAP math in grades 3-4 than in grades 5-8 while the relationship between GM volume in the left inferior frontal gyrus and TCAP math was stronger for grades 5-8. These results suggest that the neuroanatomical architecture related to in-school math achievement differs from that related to math achievement measured by
standardized tests, and that the most related neural structures differ as a function of grade level. We suggest, therefore, that the use of school-relevant outcome measures is critical if neuroscience is to bridge the gap to education.


We investigated general vocabulary and academic vocabulary growth trajectories of adolescent language minority students using an individual growth modeling approach. Our sample included 3,161 6th- to 8th-grade students from an urban school district in California. Language minority students were classified as initially fluent English proficient (IFEP), redesignated fluent English proficient (RFEP), or limited English proficient (LEP) students. The analytic sample was not a nationally representative sample and included great number of Asian students and students who receive gifted and talented education. Students were assessed at 4 time points on a standardized measure of general vocabulary and a researcher-developed academic vocabulary test. On both vocabulary measures, IFEP students slightly outperformed English-only (EO) students, and EO students scored higher than RFEP and LEP students at baseline. RFEP and LEP students showed slower rate of growth than EO peers in general vocabulary. While both EO and language minority students showed summer setback with general vocabulary knowledge, the magnitude of summer setback was not as great for LEP students. In academic vocabulary, all subgroups of language minority students showed more rapid rate of growth than EO peers. Only REP students experienced change in the learning trajectory during the summer months. We discuss the implications of these findings for all language groups.


The purpose of this study was to identify cognitive and linguistic predictors of word problems with versus without irrelevant information. The sample was 701 2nd-grade students who received no specialized intervention on word problems. In the fall, they were assessed on initial arithmetic and word-problem skill as well as language ability, working memory capacity, and processing speed; in the spring, they were tested on a word-problem measure that included items with versus without irrelevant information. Significant predictors common to both forms of word problems were initial arithmetic and word problem-solving skill as well as language and working memory. Nonverbal reasoning predicted word problems with irrelevant information, but not word problems without irrelevant information. Findings are discussed in terms of implications for intervention and future research.


Children (n=747; 6.5 years) were assessed on domain-general processes and mathematics and reading-related competencies (start of 1st grade); addition retrieval (end of 2nd grade); and calculations and word reading (end of 3rd grade). Attentive behavior, reasoning, visuospatial memory, and rapid automatized naming (RAN) indirectly contributed to both outcomes, via retrieval. However, there was no overlap in domain-general direct effects on calculations (attentive behavior, reasoning, working memory) versus word reading (language, phonological memory, RAN). Results suggest ease of forming associative relations and abilities engaged during the formation of these long-term memories are common to both outcomes and can be indexed by addition fact retrieval, but further growth in calculations and word reading is driven by different constellations of domain-general abilities.

The purpose of this study was to examine child-level pathways in development of pre-algebraic knowledge versus word-problem solving, while evaluating the contribution of calculation accuracy and fluency as mediators of foundational skills/processes. Children (n = 962; mean 7.60 years) were assessed on general cognitive processes and early calculation, word-problem, and number knowledge at start of grade 2; calculation accuracy and calculation fluency at end of grade 2; and pre-algebraic knowledge and word-problem solving at end of grade 4. Important similarities in pathways were identified, but path analysis also indicated that language comprehension is more critical for later word-problem solving than pre-algebraic knowledge. We conclude that pathways in development of these forms of 4th-grade mathematics performance are more alike than different, but demonstrate the need to fine-tune instruction for strands of the mathematics curriculum in ways that address individual students’ foundational mathematics skills or cognitive processes.


The purpose of this study was to assess the added value of dynamic assessment (DA) for predicting individual differences in year-end first-grade calculation (CA) and word-problem (WP) performance as a function of limited English proficiency (LEP) status. Beginning first graders (129 LEP; 163 non-LEP) were assessed on brief, static math tests, static tests of domain-general abilities (vocabulary; reasoning), and DA. The next spring, they were assessed on CA and WP. Regression analyses indicated that the value of the predictor depends on the predicted outcome and LEP status. In predicting CAs, the extended math test and DA uniquely explained variance for LEP children, with strong predictive value for the extended math test; for non-LEP children the extended math test was the only significant predictor. However, in predicting WPs, only DA and vocabulary were uniquely predictive for LEP children, with stronger value for DA; for non-LEP children, the extended math test and DA were comparably uniquely predictive. The potential value of a gated screening process is discussed.


This 2-phase study was designed to extend research on parent report measures of children’s productive vocabulary by investigating the development (n = 38) of the Spanish Vocabulary Extension and validity (n = 194) of the 100-item Spanish and English MacArthur-Bates Communicative Development Inventories Toddler Short Forms and Upward Extension (Fenson et al., 2000, 2007; Jackson-Maldonado, Marchman, & Fernald, 2013) and the Spanish Vocabulary Extension for use with parents from low-income homes and their 24- to 48-month-old Spanish–English bilingual children. Participants were drawn from Early Head Start and Head Start collaborative programs in the Northeastern United States in which English was the primary language of the classroom. All families reported Spanish or Spanish–English as their home language(s). The MacArthur Communicative Development Inventories as well as the researcher-designed Spanish Vocabulary Extension were used as measures of children’s English and Spanish productive vocabularies. Findings revealed the forms’ concurrent and discriminant validity, on the basis of standardized measures of vocabulary, as measures of productive vocabulary for this growing bilingual population and suggest parent reports, including our researcher-designed form, represent a valid, cost-effective mechanism for vocabulary monitoring in early childhood education settings.

Three cohorts of third-grade students (N = 813) were evaluated on achievement, cognitive abilities, and behavioral attention according to contrasting research traditions in defining math learning disability (LD) status: low achievement versus extremely low achievement (LA-LD) and IQ-discrepant versus strictly low achieving LD (IQ-ACH). We use methods from these 2 traditions to form math problem solving LD groups. To evaluate group differences, we used MANOVA based profile and canonical analyses to control for relations among the outcomes and regression to control for group definition variables. Results suggest that basic arithmetic is the key distinguishing characteristic that separates low achieving problem solvers (including LD, regardless of definition) from typically achieving students. Word problem solving is the key distinguishing characteristic that separates IQ-ACH discrepant from strictly low achieving LD students, favoring the IQ-ACH discrepant students.


Skilled reading depends on recognizing words efficiently in isolation (word-level processing; WL) and extracting meaning from text (discourse-level processing; DL); deficiencies in either result in poor reading. FMRI has revealed consistent overlapping networks in word and passage reading, as well as unique regions for DL processing; however, less is known about how WL and DL processes interact. Here we examined functional connectivity from seed regions derived from where BOLD signal overlapped during word and passage reading in 38 adolescents ranging in reading ability, hypothesizing that even though certain regions support word- and higher-level language, connectivity patterns from overlapping regions would be task modulated. Results indeed revealed that the left-lateralized semantic and working memory (WM) seed regions showed task-dependent functional connectivity patterns: during DL processes, semantic and WM nodes all correlated with the left angular gyrus, a region implicated in semantic memory/coherence building. In contrast, during WL, these nodes coordinated with a traditional WL area (left occipitotemporal region). In addition, these WL and DL findings were modulated by decoding and comprehension abilities, respectively, with poorer abilities correlating with decreased connectivity. Findings indicate that key regions may uniquely contribute to multiple levels of reading; we speculate that these connectivity patterns may be especially salient for reading outcomes and intervention response.


Specific reading comprehension deficit (SRCD) affects up to 10 % of all children. SRCD is distinct from dyslexia (DYS) in that individuals with SRCD show poor comprehension despite adequate decoding skills. Despite its prevalence and considerable behavioral research, there is not yet a unified cognitive profile of SRCD. While its neuroanatomical basis is unknown, SRCD could be anomalous in regions subserving their commonly reported cognitive weaknesses in semantic processing or executive function. Here we investigated, for the first time, patterns of gray matter volume difference in SRCD as compared to DYS and typical developing (TD) adolescent readers (N = 41). A linear support vector machine algorithm was applied to whole brain gray matter volumes generated through voxel-based morphometry. As expected, DYS differed significantly from TD in a pattern that included features from left fusiform and supramarginal gyri (DYS vs. TD: 80.0 %, p < 0.01). SRCD was well differentiated not only from TD (92.5 %, p < 0.001) but also from DYS (88.0 %, p < 0.001). Of particular interest were findings of reduced gray matter volume in right frontal areas that were also supported by
univariate analysis. These areas are thought to subserve executive processes relevant for reading, such as monitoring and manipulating mental representations. Thus, preliminary analyses suggest that SRCD readers possess a distinct neural profile compared to both TD and DYS readers and that these differences might be linked to domain-general abilities. This work provides a foundation for further investigation into variants of reading disability beyond DYS.


This study’s hypotheses were that (a) WP solving is a form of text comprehension that involves language comprehension processes, working memory, and reasoning, but (b) WP solving differs from other forms of text comprehension by requiring WP-specific language comprehension as well as general language comprehension. At start of 2nd grade, children (n=206; on average, 7 years 6 months) were assessed on general language comprehension, working memory, non-linguistic reasoning, processing speed (a control variable), and foundational skill (arithmetic for WPs; word reading for text comprehension). In spring, they were assessed on WP-specific language comprehension, WPs, and text comprehension. Path analytic mediation analysis indicated that effects of general language comprehension on text comprehension were entirely direct, whereas effects of general language comprehension on WPs were partially mediated by WP-specific language. By contrast, effects of working memory and reasoning operated in parallel ways for both outcomes.


The focus of this study was enhancing word-problem and calculation achievement in ways that simultaneously support pre-algebraic thinking among second-grade students with strong risk for mathematics difficulty (i.e., students with concurrently low performance at the start of second grade on word problems and calculations). Intervention relied on a multi-tier support system (i.e., responsiveness-to-intervention or RTI) in which at-risk students participate in general classroom instruction and receive supplementary small-group tutoring. Participants were 265 students in 110 classrooms in 25 schools. Teachers were randomly assigned to 3 conditions: calculation RTI, word-problem RTI, and business-as-usual control. The 17-week intervention provided research-based linkages between calculations or word-problem (depending on condition) instruction with pre-algebra. Multilevel modeling indicated that calculation RTI improved calculation but not word-problem outcomes; word-problem RTI enhanced proximal word-problem outcomes as well as performance on some calculation outcomes; and word-problem RTI provided a stronger route than calculation RTI to pre-algebraic knowledge.


The purpose of this study was to compare subgroups of students with various forms of learning difficulties (< 25th percentile) on cognitive and mathematics characteristics. Students with mathematics difficulty (MD, n = 105), reading difficulty (RD, n = 65), both (MDRD, n = 87), or neither (NoLD, n = 403) were evaluated on an array of cognitive measures (e.g., working memory and language) and on mathematics measures of foundational numerical competencies, computation, and problem solving. Results revealed expected level differences among groups in both domains: NoLD outperformed RD, and MD outperformed MDRD. Profile differences were noted among pairs of subgroups on cognitive measures. On mathematics measures, profile differences were noted between RD and other subgroups, but not between
MD and MDRD subgroups. The most discriminating cognitive measures were processing speed and language; the most discriminating mathematics measures depended on the subgroups being compared. Results were further evaluated according to more severe (< 10th percentile) criteria for MD and RD, which generally affected level differences more than the profile patterns. Results have implications for understanding comorbid MD and RD and for conceptualizing core deficits in MD.


Reading comprehension is a foundational academic skill and significant attention has focused on reading development. This report is the first to examine the stability and change in genetic and environmental influences on reading comprehension across Grades 1 to 6. This developmental range is particularly important because it encompasses the timespan in which most children move from learning how to read to using reading for learning. Longitudinal simplex models were fitted separately for two independent twin samples (N = 706; N = 976). Results suggested that the shared environment contributed to variance in early but not later reading. Instead, stability in reading development was largely mediated by continuous genetic influences. Thus, although reading is clearly a learned skill and the environment remains important for reading development, individual differences in reading comprehension appear to be also influenced by a core of genetic stability that persists through the developmental course of reading.


In this paper, we consider evidence from our intervention research programs on whether students with concurrent difficulty in reading and mathematics respond differentially to intervention and therefore represent distinct forms of learning disability (LD) requiring distinctive forms of intervention. We begin by examining academic and cognitive profiles of reading LD versus mathematics LD versus comorbid LD, thereby generating hypotheses about differential instructional needs of students with comorbid reading and mathematics LD. Then, to gain insight into the tenability of these hypotheses, we report analyses conducted on extant databases to consider whether and if so how students with LD in comorbid versus one area of disability respond differentially to word-problem intervention, to math facts intervention, and to most intensive forms of reading intervention. We conclude with recommendations for future research to promote valid identification of comorbid LD samples and to extend understanding of LD subtyping frameworks for improving the field’s success in helping students with LD achieve greater academic success.


The purpose of this study was to examine predictors of growth in word problem solving (WPS) among elementary students in the context of problem and situation model accounts of WPS. At the beginning of third grade, 148 students were measured on academic achievement and cognitive abilities. The students were assessed 4 times from the beginning of third through end of fifth grade on 3 measures of WPS of varying complexity. As expected, predictors of intercept and growth varied according to complexity and experience. Computation, language, inattentive behavior, nonverbal problem solving (NVPS) and concept formation (but not word reading, reading comprehension, working memory, or processing speed) predicted WPS intercepts. Only inattentive behavior, NVPS, and concept formation predicted WPS growth. Predictors of intercepts and growth in WPS varied with word problem complexity. Computation
predicted WPS performance for low and moderate-complexity problems but not high-complexity problems. NVPS predicted growth in WPS skill for moderate- and high- but not low-complexity word problems.


The purpose of this study was to assess whether understanding relational terminology (i.e., more, less, and fewer) mediates the effects of intervention on compare word problems. Second-grade classrooms (n = 31) were randomly assigned to 3 conditions: researcher-designed word-problem intervention, researcher-designed calculation intervention, or business-as-usual (teacher-designed) control. Students in word-problem intervention classrooms received instruction on the compare problem type, which included a focus on understanding relational terminology within compare word problems. Analyses, which accounted for variance associated with classroom clustering, indicated that (a) compared to the calculation intervention and business-as-usual conditions, word-problem intervention significantly increased performance on all three subtypes of compare problems and on understanding relational terminology; and (b) the intervention effect was fully mediated by students’ understanding of relational terminology for 1 subtype of compare problems and partially mediated by students’ understanding of relational terminology for the other 2 subtypes.


The primary purpose of this study was to assess the effects of strategic counting instruction, with and without deliberate practice with those counting strategies, on number combination (NC) skill among students with mathematics difficulties (MD). Students (n = 150) were stratified on MD status (i.e., MD alone vs. MD with reading difficulty) and site (proximal vs. distal to the intervention developer) and then randomly assigned to control (no tutoring) or 1 of 2 variants of NC remediation. Both remediations were embedded in the same validated word-problem tutoring protocol (i.e., Pirate Math). In 1 variant, the focus on NCs was limited to a single lesson that taught strategic counting. In the other variant, 4-6 min of practice per session was added to the other variant. Tutoring occurred for 16 weeks, 3 sessions per week for 20-30 min per session. Strategic counting without deliberate practice produced superior NC fluency compared to control; however, strategic counting with deliberate practice effected superior NC fluency and transfer to procedural calculations compared with both competing conditions. Also, the efficacy of Pirate Math word-problem tutoring was replicated.


The purposes of this study were to assess the efficacy of remedial tutoring for 3rd graders with mathematics difficulty; to investigate whether tutoring is differentially efficacious depending on students’ math difficulty status (mathematics difficulty alone vs. mathematics plus reading difficulty); to explore transfer from number combination (NC) remediation; and to examine the transportability of the tutoring protocols. At 2 sites, 133 students were stratified on mathematics difficulty status and site and then randomly assigned to 3 conditions: control (no tutoring) or tutoring on automatic retrieval of NCs (i.e., Math Flash) or tutoring on word problems with attention to the foundational skills of NCs, procedural calculations, and algebra (i.e., Pirate Math). Tutoring occurred for 16 weeks, 3 sessions per
week and 20-30 min per session. Math Flash enhanced fluency with NCs with transfer to procedural computation but without transfer to algebra or word problems. Pirate Math enhanced word-problem skill as well as fluency with NCs, procedural computation, and algebra. Tutoring was not differentially efficacious as a function of students’ mathematics difficulty status. The tutoring protocols proved transportable across sites.


The purpose of this study was to explore patterns of difficulty in 2 domains of mathematical cognition: computation and problem solving. Third graders (n = 924; 52.7% male) were representatively sampled from 89 classrooms; assessed on computation and problem solving; classified as having difficulty with computation, problem solving, both domains, or neither domain; and measured on 9 cognitive dimensions. Difficulty occurred across domains with the same prevalence as difficulty with a single domain; specific difficulty was distributed similarly across domains. Multivariate profile analysis on cognitive dimensions and chi-squares on demographics showed that specific computational difficulty was associated with strength in language and weaknesses in attentive behavior and processing speed; problem-solving difficulty was associated with deficient language as well as race and poverty. Implications for understanding mathematics competence and for the identification and treatment of mathematics difficulties are discussed.


The purpose of this study was to assess the effects of preventative tutoring on the math problem solving of third-grade students with math and reading difficulties. Students (n = 35) were assigned randomly to continue in their general education math program or to receive secondary preventative tutoring 3 times per week, 30 min per session, for 12 weeks. Schema-broadening tutoring taught students to (a) focus on the mathematical structure of 3 problem types, (b) recognize problems as belonging to those 3 problem-type schemas; (c) solve the 3 word- problem types; and (d) transfer solution methods to problems that include irrelevant information, 2-digit operands, missing information in the first or second positions in the algebraic equation, or relevant information in charts, graphs, and pictures. Also, students were taught to perform the calculation and algebraic skills foundational for problem solving. Analyses of variance revealed statistically significant effects on a wide range of word problems, with large effect sizes. Findings support the efficacy of the tutoring protocol for preventing word-problem deficits among third-grade students with math and reading deficits.


This study assessed responsiveness to a 16-week mathematical problem-solving treatment as a function of students’ risk for disability. Among 301 third graders, state achievement test scores were used to categorize students as at risk for both reading and mathematics disability (MDR/RDR; 20 control and 12 experimental), at risk for mathematics disability only (MDR-only; 5 and 8), at risk for reading disability only (RDR-only; 12 and 15), or not at risk (NDR; 60 and 69). Interactions among at-risk status, treatment, and time showed that as a function of treatment, MDR/RDR, MDR-only, and RDR-only students improved less than NDR students on computation and labeling, and MDR/RDR students improved less than all other groups on conceptual underpinnings. Exploratory regressions suggested that MDR/RDR students’ math deficits or their underlying mechanisms explained a greater
propion of variance in responsiveness to problem-solving treatment than reading deficits or their underlying mechanisms

Requesting Information on Database Usage
The Project study, which is in progress, will include data from 455 second-grade children identified with comorbid LDs or as average or high in MPS & RC. The final data set will comprise parent or teacher reported information, teacher reports of attentive behavior, and behavioral tests of mathematics, reading, and linguistic/cognitive abilities. Variables will become available as manuscripts reporting on those variables are published. The Hub will prepare and make de-identified datasets electronically available to external users under a data-sharing agreement that provides for (1) a commitment to using the data only for the research purposes described in the user’s request; (2) assurance that no individual will be identified for any purpose; (3) a commitment to secure the data using appropriate computer technology; (4) a commitment to destroying or returning the data after analyses are completed; and (5) guarantees that publications are credited to NICHD and to this grant and are entered into PubMed. The outside user will submit a request to L. Fuchs describing variables of interest, the research purpose/questions, the quantitative methods to be applied to the requested data, and how those methods will answer the research questions. Within 2 months of the outside user’s request, L. Fuchs in collaboration with the other Hub Investigators will formulate a decision, based on whether the proposed variables are part of the database; the research questions can be answered with those variables; and the plan is internally consistent, quantitatively sound, and tenable. If so, the decision is yes, and a database with the variables of interest will be provided, along with the code book for those variables. If not, we will provide a written communication explaining this decision. If we are unclear, we will provide a written request for clarifications, with up to 2 rounds. If approved, L. Fuchs will prepare and send a Data Use Agreement Form to the outside user (outlining terms for data use & guarantees). The relevant (de-identified) data will then be extracted and provided to the user along with relevant portions of the code book. We will also provide a published study that describes the sample, study, and procedures. For additional information, contact lynn.fuchs@vanderbilt.edu.