Considering context, place and culture: the National Latino and Asian American Study

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Abstract

This paper provides a rationale for, and overview of, procedures used to develop the National Latino and Asian American Study (NLAAS). The NLAAS is nationally representative community household survey that estimates the prevalence of mental disorders and rates of mental health service utilization by Latinos and Asian Americans in the US. The central aims of the NLAAS are to: 1) describe the lifetime and 12-month prevalence of psychiatric disorders and the rates of mental health services use for Latino and Asian American populations using nationwide representative samples of Latinos and Asian Americans, 2) assess the associations among social position, environmental context, and psychosocial factors with the prevalence of psychiatric disorders and utilization rates of mental health services, and 3) compare the lifetime and 12-month prevalence of psychiatric disorders, and utilization of mental health services of Latinos and Asian Americans with national representative samples of non-Latino whites (from the National Comorbidity Study-Replication) (NCS-R) and African Americans (from the National Survey of American Life) (NSAL). This paper presents new concepts and methods utilized in the development of the NLAAS to capture and investigate ethnic, cultural and environmental considerations that are often ignored in mental health research.

Key words: culture, Latinos, Asian Americans, context, research design, acculturation, National Latino and Asian American Study, psychiatric epidemiology, NLAAS, service use, ethnicity, mental disorders, Bayesian analysis

Introduction

The US has been and continues to be profoundly shaped by its immigrants and their children. Annual naturalizations of immigrants peaked at 1 million in 1996 and current numbers are well over the levels of the 1980s (Fix, Passel and Sucher, 2003). Over the past 25 years, a large proportion of immigrants and naturalized citizens have come from Mexico, China,

the Philippines, and other Asian, Latin and South American countries. For purposes of planning and demographic description, the US government often combines persons from Asia and the Pacific islands into an Asian American group, and persons from Spanish speaking countries as a Hispanic or Latino group. With this grouping, Latinos are now the largest minority group in America (12.5% of the US population) and there is also a growing representation of Asian Americans (3.7%) (US Census Bureau, 2001).

Although Latino and Asian Americans are vibrant contributors to community life in American society, there is minimal information about the public health of these groups. In recent years, our collaborative research team has begun to rectify this shortcoming in terms of mental health need and service use. In this paper we describe the National Latino and Asian American Study (NLAAS), the first psychiatric epidemiological and service use study of Latinos and Asian Americans using a national sampling frame to select interview respondents. Details about the sampling design and data collection process are presented in papers by Heeringa et al. and Pennell et al. elsewhere in this special issue. The NLAAS is specifically designed with uniform procedures in sampling and a common instrument to allow comparisons of Latinos and Asian Americans as well as comparisons of these groups with Americans of European and African descent. The following description provides the rationale for the study and an overview of the NLAAS research agenda.

Background

Immigration has changed the racial composition in the US, a demographic change unseen since the late seventeenth century when black slaves became part of the labour force in the south (Mueller, 1993). A major difference between the rise in the immigrant population in the early 1900s and the current increase is the variation in countries of origin. In the early 1900s, most immigrants came from Europe and Canada, whereas recent immigrants come primarily from Asia and Latin America. Projections for the year 2020 indicate that Latinos alone will account for one of every three persons born in the US, and Asian Americans, the fastest growing ethnic category in the US in terms of percentage increase, are estimated to triple in number to more than 20 million by the year 2025 (Lee, 1998).

Despite the dramatic population increase and emergent visibility of Latino and Asian ethnic groups, limited information is available at the national level that documents their rates of psychiatric illness and unmet need for mental health services and the factors associated with psychopathology. There is an absence of baseline data for Latinos and Asians at the national level from which to define their progress and establish a set of measurable health targets to improve their mental health status by the year 2010 (US Department of Health and Human Services, 2000). The limited data available on Latinos and Asian Americans make it difficult to develop coherent public policies and systematic guidelines aimed at making treatment decisions and services more responsive to the needs of these two groups. New data are needed to support policy decisions because effective actions to mitigate disparities must be based on empirical evidence. Specifically, a first step is to ascertain where ethnic/racial disparities exist in psychiatric illness and service use. For this reason, one important priority in the nation's research agenda is to assess the prevalence of mental illness and service use for Latinos and Asians in the US. The NLAAS is a psychiatric epidemiological study measuring psychiatric disorders and mental health service usage in a nationally representative household sample of Asians and Latinos in the US. It is one of the most comprehensive studies using up-to-date scientific strategies in the design, sampling procedures, statistical analysis, and psychiatric assessments.

The NLAAS investigates social, cultural and contextual correlates of disease expression (Alarcón, 1983; Fabrega, 1990; Kirmayer and Young, 1999) that can elucidate the role of ethnicity/race in psychiatric disorders and service use. The study provides conceptual contributions by adopting a model (McKinlay and Marceau, 1999) modified for psychiatric eco-epidemiology (Schwartz et al., 1999) that assumes a strong role of context as well as social and cultural factors in understanding the risk for psychopathology. According to this model (evaluated as part of our research aims) the risk of psychiatric illness is linked to social position at the primary level, environmental context at the secondary level and psychosocial factors at the tertiary level to explain the potential differences in psychiatric disorders and patterns of service across sub-ethnic Latino and Asian American groups. Psychiatric illness comprises the lifetime and last year DSM-IV diagnoses measured by the Composite International Diagnostic Interview

(CIDI) schedule. The model posits that the risk of psychiatric illness is associated with a person's relative social position in US society (as defined by their ethnicity, race, education, occupation, income, wealth, and social status) and how their social position matches their expectations of social mobility and social status.

Environmental context defined by the neighbourhood characteristics (such as social cohesion and neighbourhood safety) and geographical area-based characteristics (according to Census county data such as average household income, percent unemployed, ethnic density, population density, and so forth) also relates to the risk of psychopathology. Environmental context can correlate with psychiatric disorders because it represents commonly held views about life that may affect how one labels one's relative social position and social status. It can also capture important aspects of the physical and social contexts that may adversely affect or protect against mental health problems or that may increase or decrease service use. Psychosocial factors are the intermediary individual and social factors that link social position and social context with mental health and service use. Among the most salient ones are familism, migration and acculturation, discrimination, and social networks. The importance of the family to Asian Americans and Latinos is cited quite extensively in the literature as decreasing one's risk for mental illness (Marin and Vanoss-Marin, 1991; Triandis et al., 1982; Hofstede, 1990) but few empirical studies have actually tested this supposition. In the NLAAS, we can assess whether individuals who maintain familial interaction and support have low rates of psychiatric disorders.

Although the NLAAS focuses specifically on Asian and Latino populations, the concepts and methods applied in this study seek to establish innovative research mechanisms that may enhance researchers' ability to compare and understand psychiatric disorders and service needs of different ethnic/racial populations. The central aims of NLAAS are:

1. To estimate the lifetime and 12-month prevalence of psychiatric disorders and the rates of mental health services use for Latino and Asian American populations using nationwide representative samples of Latinos and Asian Americans. We investigate the importance of national and subgroup differences within the broad Latino and Asian American categories.

2. To estimate the relation of social position, environmental context, and psychosocial factors with the prevalence of psychiatric disorders and utilization rates of mental health services in nationwide representative samples of Latinos and Asian Americans.

3. To compare the lifetime and 12-month prevalence of psychiatric disorders, and utilization of mental health services of Latinos and Asian Americans with national representative samples of non-Latino whites (from the National Comorbidity Study-Replication – NCS-R) and African Americans (from the National Survey of American Life – NSAL). We again estimate the role of social position and environmental context as factors that may explain the ethnic/race differences in disease and service use.

NLAAS research approach

Assessing the impact of cultural and contextual influences on psychiatric disorders and service use may require both conceptual and methodological approaches that take into account the uniqueness of the different ethnic and racial groups that may affect data collection and the interpretation of results. Considering the uniqueness of ethnic and racial groups may allow us to identify factors that are significant in shaping the expression of psychiatric disorders and the culture-specific processes linked to differences found between groups. To address the conceptual and methodological questions related to psychiatric illness and service use, we briefly outline below some of NLAAS strategies: 1) rigorous approaches used to translate and adapt survey instruments; 2) incorporation of cultural idioms of distress (such as 'ataque de nervios' and neurasthenia) as part of the prevalence estimates of psychiatric disorders; 3) allowing respondents to be interviewed either in English or in their native language; 4) an experiment to assess the impact of language on prevalence rates of psychiatric disorders; and 5) an instrumentation experiment to test the effect of survey conditioning on service use rates. A series of separate papers describes these approaches and the results in more detail. The methods emphasize language, cultural matching of interviewers to respondents and formal survey experiments of response effects.

The Spanish and Asian versions of the CIDI went

through an intensive process of translation and adaptation (for a detailed description, see Alegria et al., in this same issue). Translation and cultural relevancy adaptation were necessary for an instrument that had not been previously tested among ethnic groups under study. The model used to translate and adapt these diagnostic measures was based on cross-cultural equivalency in the following domains (described by Bravo, Canino et al., 1991): semantic (ensures that instruments are accurately translated into different languages), content (ensures that content of instruments is relevant to the study population), technical equivalence (ensures that similar layouts are used for instruments across cultures, and that the measuring strategies implemented obtain a similar effect across cultures) and criterion/conceptual equivalence (ensures that the same theoretical construct is evaluated in each culture, and that the interpretation of the results is similar when evaluated in accordance with the norms of each culture) (Gaviria et al., 1985; Flaherty, 1987; Bravo and Canino, 1993; Matias et al., 2003). The CIDI was translated into a common Spanish by an international team of bilingual Latino investigators from different Latino-subgroups including Spain, Latin America and South America. We also included several measures to better understand variations among Asian and Latino ethnic groups in disease prevalence and service use. Details of the process of translation and adaptation of our survey measures are provided in the second article by Alegria et al., 2004 in this same issue.

One major difference between the NCS-R or NSAL, which conduct all of their interviews in English, and the NLAAS is that the NLAAS is designed to interview in Tagalog, Vietnamese, Chinese, Spanish or English. Multilingual interviewers employed in the NLAAS were certified to be fluent in both English and the other language (Spanish for Latinos, and Chinese, Tagalog, or Vietnamese for Asian Americans). This design allowed for the inclusion of the large percentage of Latinos and Asian Americans who are first-generation immigrants with limited English fluency. Surveys restricted to English eliminate large segments of both ethnic categories from the national survey, and require others to respond to sensitive and complex questions in a language they understand poorly. For example in the NLAAS, 48% of the Latino respondents indicated that they only spoke Spanish or Spanish and some English, and 34%

of Asian Americans responded that they only spoke an Asian language or an Asian language and some English. In addition, 50% of Latinos and 35% of Asian Americans in the NLAAS rated their English proficiency as fair or poor, potentially excluding them from an English-only diagnostic assessment. The NLAAS broadens the category of those who can be represented in psychiatric epidemiology studies at a national level.

At the same time, Latino and Asian American ethnic categories encompass a wide range of national backgrounds, social classes, races, legal status, and levels of acculturation, migration histories and literacy in English, among other distinctions. In the past, researchers typically thought of Asian Americans or Latinos as homogeneous groups, and this categorization has constrained analyses of ethnic differences in mental disorder patterns (Zane and Sasao, 1992). One consequence of this deficiency is that insufficient data is available about whether Latino and Asian American subgroups differ in the prevalence of psychiatric disorders and service use and the explanations for the potential differences. Furthermore, although previous epidemiological data suggested an effect of acculturation on the risk for psychiatric morbidity (Ortega et al, 2001), this effect could not be studied in depth because most epidemiological studies (NCS, ECA) did not assess acculturation or only included a few items in their survey instruments. The NLAAS sample design includes representation of eight ethnic sub-groups (Mexicans, Puerto Ricans, Cubans, Other Latinos, Chinese, Vietnamese, Filipinos, and Other Asians) for performing intra-ethnic comparisons among Latino and Asian American subgroups, with various levels of acculturation assessed by several measures. There are fundamental scientific reasons for focusing on these subgroups of Latinos and Asian Americans. They come from different social, cultural and historical circumstances that lead to some interesting comparisons about the factors associated with psychiatric disorders and service use. For example, among Asian Americans, on average, Chinese Americans have higher socioeconomic status (SES) than Filipino Americans. When examined closely, however, Chinese Americans have a SES distribution that is bimodal with representations at the high and low ends of the SES continuum. Conversely, there is considerable geographic variation in the SES distribution of Filipino Americans. Filipino Americans in Hawaii, on average, have lower SES levels than Filipino Americans in northern California.

As compared to Mexicans, Cubans and other Latinos, Puerto Ricans are more likely to be US citizens, to have two parents born in the US, to have a higher ratio of years in the US, to report greater English proficiency, and to live in the north-east. Mexicans are younger, with less education and less household income, more likely to be married and to be living in the west and the south as compared to the other Latino groups. We will test whether these variations in social and contextual circumstances are correlated with potential intra-ethnic differences in psychiatric disorders and service use.

The interpretation of 'ethnic' effects in the context of psychiatric disorders and service use is an area that has consistently been unclear. When a variable representing a Latino or Asian American category is identified as important in a regression that explains psychiatric illness or use of services, the finding fails to enlighten us about the reason for the association. To identify this statistical association requires the measurement of other constructs (such as cultural values, citizenship, English proficiency, discrimination, or region) that may be correlated with the ethnic category. An example is the concept of acculturation, a complex multidimensional construct that refers to the process whereby immigrants change their behaviour and attitudes toward the host society. Some claim that change in attitudes and values refers to assimilation (See Escobar and Vega, 2000). Acculturated Latinos of different nationalities evidence increased likelihood for both psychiatric and substance disorders than their less acculturated counterparts (Ortega et al., 2000) but it is less clear why this association occurs. The NLAAS goes beyond the use of ethnic and racial typical categories (for example, white, Latino, Asian or African American) to address which dimensions of ethnicity/race may be associated with psychiatric disorders and service use. In the NLAAS, investigating the role of social position, environmental context and psychosocial factors may help identify the mechanisms that link acculturation to psychiatric illness and mental health service use. In examining differences in the prevalence rates of psychiatric disorders and service use rates, we can evaluate whether the differences across ethnicity/racial subgroups relate to dimensions that encompass language preference, language proficiency, ethnic and racial affiliation, behaviours and attitudes congruent with the person's ethnic/race culture (for example,

familism, spirituality), citizenship, time living in the US, ethnic density in the region of residency, or exposure to discrimination. By adopting a multidimensional construct of race/ethnicity, this work begins clarifying the meaning of 'ethnic/race' effect, and eventually leads us to understand how ethnicity, race, culture change, and social stress may be related to psychiatric illness and service use.

Not considering the cultural background of individuals as well as cultural change can result in either incorrect inferences of pathology, or failure to recognize existing disorder (Favazza and Oman, 1984; Kleinman, 1988; Westermeyer and Janca, 1997). There is persistent evidence that a patient's cultural background colours every facet of illness experience, from linguistic structure and content of delusions (Karno and Jenkins, 1993; Ribeiro, 1994) to the unique meaning of expressed emotion (Kleinman, 1988; Lewis-Fernandez, 1996). Several approaches used in the NLAAS test artifactual explanations for the observed rates of psychiatric disorders and service-use patterns in Latinos and Asians. For example, we test whether there are potential exclusions of symptomatology of certain disorders that may lead to the underestimation of psychiatric disorder rates. Ethnic minority groups may present symptoms that are not part of the established nosology, whereby there is only a partial overlap of the diagnostic construct being assessed, what has been label construct bias. While neurasthenia has virtually disappeared from the range of diagnoses that most psychiatrists identify in their patients, it remains a problem strongly related to major depression identified among Asians in clinical settings (Zhang, 1989). Similarly, 'ataque de nervios' is an idiom of distress prominent among Latinos that may appears to be part of the symptom repertoire of depression. Approximately 16% of a representative sample of Puerto Ricans reported experiencing this problem (Guarnaccia et al., 1989). We evaluate whether these syndromes are part of the expression of certain psychiatric illnesses for either Latinos or Asians and how including them changes the 12-month prevalence of certain psychiatric disorders. The measurement of these syndromes allow us to test whether Latinos and Asians, especially those who are less acculturated, are more likely to express specific psychiatric illness with these cultural idioms.

Another approach used to evaluate potential construct bias influencing the prevalence rates of certain

psychiatric disorders was the expansion of the screener probes that entered respondents into specific psychiatric disorder batteries in the NLAAS. If screener probes are less recognized as depicting symptoms of a particular disorder for Asians or Latinos, they may fail to convey the equivalent conceptual meaning of the question, thereby increasing the likelihood of a negative endorsement by Latino or Asian respondents and artificially lowering prevalence rates for the population of interest. Based on the extensive qualitative work performed to refine the translation and adaptation of the NLAAS instrument, we asked respondents to offer alternative screener probes that reflected similar symptoms or behaviours as well as articulate how they understood the original probes. Using this information, we generated one additional probe for entry into each of the following disorders that was only asked if the respondent had negatively endorsed all other probes for that disorder (what would have been negative cases): depression, panic disorder, generalized anxiety disorder, and mania. The use of these additional probes entered an additional number of negative cases into the respective diagnostic batteries: 0.8% of Latinos and 2.4% of Asian Americans into the panic disorder battery, 21.3% of Latinos and 14.5% of Asian Americans into the depression disorder battery, 11.6% of Latinos and 6.5% of Asian Americans into the mania battery; and 6.4% of Latinos and 5.5% of Asian Americans into the generalized anxiety disorder battery.

These additional probes will allow us to compare prevalence rates of the disorder, excluding and including the extra cases that entered through these additional screener probes, and explore potential sources of construct bias in diagnostic assessment. We will supplement the analyses by conducting qualitative evaluations of the audiotaped diagnostic assessments conducted as part of the clinical reappraisal. The NLAAS clinical re-appraisal of the Spanish CIDI involved reinterviewing 195 subjects from the Latino sample who met criteria for nine psychiatric disorders, met criteria for a sub-threshold disorder, or were negative cases. Interviews were conducted by telephone by expertly trained bilingual bicultural clinicians who administered the Structured Clinical Diagnostic Interview (SCID). We expect the clinical reappraisal to provide further information of whether the sub-threshold or negative cases of several disorders may be associated to problems of construct bias in diagnostic batteries for Latino populations.

Analyses being conducted in the NLAAS also test how translation and cross-cultural adaptation of structured mental health interviews affect the results of psychiatric epidemiological surveys. Even when bilingual translators reach consensus on different language versions of a diagnostic instrument, it is still possible that respondents will have dissimilar interpretations of words or response alternatives in the translated version. In the NLAAS, we conducted a language experiment to evaluate whether translation effects influence the prevalence of psychiatric disorders. Bilingual participants were randomly assigned to either the English or Spanish version of the survey interview. By comparing the prevalence of mental disorders reported by the randomly equivalent language groups, we can determine if the choice of words influences the reporting process, and consequently the prevalence rates. The results of these analyses are described in a manuscript by Dr Patrick Shrout and other NLAAS collaborators currently under preparation.

The NLAAS also included an instrumentation experiment to test the effect of survey conditioning on service use rates. The investigators hypothesized that the responses to survey items placed in the latter portion of the survey instrument would be influenced by experience gained from the earlier portion of the survey. The general assumption was that if the respondent learned in the earlier part of the survey that positive responses to certain service stem questions lead to additional inquiries, they might respond negatively to other similar stem questions encountered later in the survey to avoid the burden. Several investigators (Vega, 1998; Jensen, Watanabe and Richters, 1999) had previously shown that there could be symptom attenuation within the same administration. Following this same rationale, we conducted a randomized trial as part of NLAAS to examine the potential impact of attenuation on reported mental health service use. In order to allow for comparisons between NLAAS service-use data with NCS-R and NSAL, 75% of the NLAAS sample was assessed using the traditional format with each stem question of a specific service (for example, use of a psychiatrist) followed by the corresponding detailed service questions for that same provider (psychiatrist) before presenting the next stem question for the second type of service provider (for instance, general health provider) in the service-use assessments.

The other 25% of the NLAAS sample was assessed using a modified instrument to reduce the potential impact of attenuation, placing stem questions for all of the assessed services up front in the battery (immediately after the psychiatric symptoms screeners) and then following the respondent's previous positive endorsements to each service sector during the detailed questioning later in the battery. The two subsamples (the 75% under the traditional instrument and the 25% under the modified instrument) were then compared to assess survey conditioning and attenuation effects. For each service-use measure, we compared the presence versus the absence of service-use reported under the two versions of the instrument, using the χ^2 test for the two-way cross-tabulation of instrument version by service use status. We replicated these analyses using logistic regression models that controlled for additional covariates. All of those analyses are described in a manuscript under preparation by Dr Naihua Duan and other collaborators.

Additional NLAAS areas of methodological innovation

In the process of analysing the NLAAS data, we confronted challenges that required innovative applications of some most advanced statistical and computational techniques. Below we briefly describe two of these ongoing areas of methodological innovation because they may serve other investigators conducting similar psychiatric epidemiological work: Bayesian estimation of prevalence of psychiatric disorders and the use of multiple imputation to deal with missing data. Details of these methods are described in manuscripts under preparation by Dr Xiao-Li Meng and other collaborators.

One key statistical challenge in using the NLAAS data for estimating prevalence of psychiatric disorders and service use rates is the large sampling and other survey variations due to small sample sizes, especially for 'small domains' (as known in the survey literature) such as specific ethnicity and age groups. Naïve estimates based directly on the observed (weighted) sample rates often lead to a much-distorted picture of the reality. The following example provides an illustration of an extreme case. The observed prevalence rates – weighted sample averages, for lifetime major depressive disorder based on preliminary sample and weights for Cuban males, as a function of ten age groups – are presented in Table 1.

The large variations in the observed rates, especially for the first six age groups, are clearly due to large survey errors because of the small sample sizes (note that because these are weighted samples with large variations in weights, the 'effective sample sizes' are even smaller). There are no scientific reasons to believe that the actual prevalence rates can fluctuate nearly as much – for example, the 60% prevalence for Cuban males between 18–21, and 0% for 22–5, and then back again to near 49% for the 26–9 age group, is clearly far from reality. Although the actual prevalence rates do change with age, they must change at a much smoother pace, based on previous studies and related evidence cumulated in the literature. Bayesian methods (for example, Gelman et al., 2004) allow us to incorporate such prior information, as well as our best scientific judgement (for example, concerning the implausibility of the rapid zig-zagging changes in the prevalence rates), to combat the problem of large sampling errors due to small sample sizes. The methods we have adopted postulate a quadratic rate curve as a function of age, based on common observations that

Table 1. Observed and estimated prevalence rates (based on a preliminary Bayesian model) for lifetime major depressive disorder based on preliminary NLAAS sample and weights

Age group	18–21	22–25	26–29	30–33	34–37	38–41	42–46	47–53	54–63	>63
N observed	9	8	20	18	16	12	26	28	44	48
Weighted sample average (%)	60.0	0.00	49.2	6.3	50.0	0.0	3.3	6.9	10.2	1.7
Bayes estimate (%)	56.2	22.8	39.6	12.2	32.1	7.1	6.2	6.3	6.5	2.3

the rates tend to increase with age but then dramatically decline for high age groups (one likely cause for this decrease for high age groups is that depression appears to be a good predictor of death). However, unlike traditional curve-fitting methods (for example, least-square methods), the Bayesian methods we use do not just fit this curve and then estimate the age-specific prevalence rate by 'reading off' the fitted curve. Such a method would not be reliable either, because its accuracy will be highly sensitive to the assumption that the actual rate follows the posited curve, which at best is just a mathematical idealization. Instead, Bayesian methods produce estimates that are weighted average of the observed rate and the rate from the fitted curve with weights proportional to how accurate each estimate is as assessed by the method itself. Unlike traditional curve-fitting methods, however, the Bayesian methods require substantially more computation. Recent advances in statistical computation and computing environment have made such a task easier. We are currently testing different Bayesian models and associated algorithms for efficient computation. Our ultimate goal here is to provide reliable and flexible (with 'tunable' input to accommodate different studies) software for routine analyses of this sort.

As an illustration, the last row of Table 1 gives our estimates of the rate based on a preliminary Bayesian model using the preliminary NLAAS sample and weights. These estimates exhibit more smooth changes over age groups as compared to the weighted sample averages. As partial evidence to the need of such Bayesian methods, as well as its scientific validity, we can compare these Bayesian estimates with the weighted sample averages calculated from the final sample and weights, as given in the third row of Table 2.

The weighted sample averages in Table 2 here should be more reliable than those in Table 1 because of the increased sample sizes and more reliable weights. We indeed observe that the new weighted sample averages are much 'smoother' than the previous ones as a function of age. More importantly, the Bayes estimates given in Table 1 evidently move towards the more reliable weighted sample averages obtained from the final sample, and away from weighted sample averages calculated using the preliminary sample. Nevertheless, the true rates are nearly certain to be even smoother than the observed ones (for example, the rapid change from 46.2% to 12.6% is still very probably due to small sample variations), and our Bayesian methods deal with this problem by 'pooling' between the observed rates and the much smoother ones fitted by the quadratic curve.

The last row of Table 2 gives our Bayes estimates, using the same model as before but based on the final sample and weights, and they provide a set of rate estimates that are clearly more plausible (for instance, they suffer much less from the dramatic changes between adjacent age groups) than either set of the weighted sample means. (Our Bayesian methods also automatically generate error bars to allow honest assessment of the accuracy in any of our estimates.) We have also performed some preliminary simulation studies to confirm the superiority of our Bayesian methods, and we plan to conduct more to demonstrate the necessity and superiority of the methods, as well as to investigate their applicability and limitations for different problems.

A second major component of our investigation for Bayesian estimation is to obtain reliable variance estimates for the weighted sampling rates with small sizes and substantially varying weights. This is a well-

Table 2. Observed and estimated prevalence rates (based on a preliminary Bayesian model) for lifetime major depressive disorder based on final NLAAS sample and weights

Age group	18–21	22–25	26–29	30–33	34–37	38–41	42–46	47–53	54–63	>63
N observed	11	16	26	23	18	12	30	31	54	55
Weighted sample average (%)	46.2	12.6	21.5	10.6	25.1	0.0	5.0	5.9	9.5	7.9
Bayes estimate (%)	40.7	20.3	19.4	12.3	15.6	6.8	6.2	5.8	7.5	8.4

known problem in practice, without generally satisfactory 'off-the-shelf' solutions. Consequently we have been investigating and comparing several methods for the problems we have at hand, including possible models for variance estimations. Reliable variance estimates are important for our Bayesian methods because they directly affect the weights in pooling between the observed rates and the rates estimated from the fitted curve.

However, the Bayesian methods are not 'magic' – they are only probabilistic ways to combine information – that is, information from the observed data and our knowledge based on previous studies and expert judgements. In other words, the methods we use cannot (and should not) generate more information than the observed data and our prior knowledge can provide. As a result, when data exhibit large variations, the 'interval bands' we obtain from the Bayesian methods will tend to be quite wide unless there is strong prior information. This is not a problem of the methods but rather an honest reflection of the uncertainty inherent in the data and our prior knowledge. Indeed, the weighted sample means given in Table 1 and Table 2 for one extreme case (Cuban males) demonstrate the large variations exhibited in these estimates with small sample sizes, for example, the dramatic change from 50% rate for age group 34–7 based on the preliminary sample of size 16 to 25% rate based on the final sample of size 18. Any analysis that does not honestly assess and reflect such large uncertainties is scientifically unacceptable because a 50% prevalence and 25% prevalence can have substantially different policy and other implications.

Consequently, in order to narrow our interval estimates, we will need to 'borrow' information from other studies. We have just received data from National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), for which we plan to apply our Bayesian methods to obtain a set of distributional estimates of psychiatric disorders, which will then be used to as prior input for our current NLAAS study. This approach allows information from previous or other studies to be used effectively, even though these other studies use different survey instruments from those used for NLAAS. Nevertheless, careful consideration is needed in combining studies with different survey designs and instruments. This is the third key component in our ongoing methodological development for Bayesian estimation of prevalence of psychiatric disorders.

Another major statistical task for the NLAAS study is to use multiple imputation to address the fact that the 75% of the sample obtained via a traditional instrument appears to suffer from a severe problem of under-reporting service rates due to the ordering effect of a set of service-use questions, as clearly demonstrated in Duan et al. (2004). The main purpose of this task is to use the other 25% samples, which were obtained under a much improved instrument that largely eliminates the ordering effect, to impute the underreported part of the 75% sample, and thereby to substantially reduce the underestimation of the actual service rates. Imputation methods are preferred here because our goal is to 'repair' our database once and for all, so that the users of the data can conduct standard complete-data analysis without worrying about the problem of underestimation due to the ordering effect. However, because imputation does not create more information than the data can actually provide, the user's analysis needs to reflect honestly the uncertainty due to not knowing the actual response, now matter how accurate is the imputation. Multiple imputation (Rubin, 1987) is a well studied and documented method in statistical literature for addressing this problem. By imputing the missing values (as a set) multiple times, say 10 times, the users can conduct 10 complete-data analyses, and the differences among these 10 sets of complete-data analyses can be easily used to estimate the uncertainty due to imputation, which is then used to obtain valid statistical inference. The key step for this multiple imputation is to build an imputation model that allows the prediction of the use of the service based on other surveyed variables, whose reported values are not affected by the ordering of the questions for the service use. The central challenge here is that there are literally thousands of variables to choose from. Unlike with a traditional variable selection setting, where the investigator typically focus on selecting a 'best' set of variables for the study at hand, for imputation we need to include as many possible predictors that can be of interest to potential users of the dataset, even though some of these variables do not appear to have much 'predictive power' for our imputation (Rubin, 1987; Meng, 1994; Barnard and Meng, 1999). The reason is that when a user is interested in studying a particular relationship between the service rate and, say, whether the patient

carries any insurance, the user may not include in his/her study other predictors that are correlated with the insurance variable, for example, the income variable. If we did not include the insurance variable in our imputation model because it does not provide additional gain in prediction accuracy once the income variable is included, for this user his estimation of the correlation between the service rate and insurance variable will have a negative bias because our imputation model has artificially eliminated such correlation for the imputed cases. An illustrative example of this sort can be found in Clogg et al. (1991) in the context of multiply imputing occupation coding for census databases.

On the other hand, it is neither practical nor desirable to include too many variables because the resulting models will have too many parameters to be fitted reliably given the limitation of the amount of data as well as of computational power. Our current effort therefore has been to make a sensible compromise between the desire of including all potentially interested predictors and the limitation of the data and computing power. We once again adopt the Bayesian methods, which allow us to put prior distributions on the regression coefficients to regulate the ill-fitting problem and thereby to increase the amount of predictors we can include. Nevertheless, the associate computational demand is far greater than what is needed by our Bayesian estimation of the prevalence rates.

However, the algorithms that we have developed for the prevalence rate estimations serve as an excellent starting point for building and testing the more elaborated algorithms for multiple imputation with many predictors. They use the same type of general algorithms, in particularly the Metropolis-Hasting algorithms and Gibbs sampler, the two most well-know types of Markov chain Monte Carlo algorithms that have been utilized extensively in physics, computational biology, statistics, and many other fields with astonishing success (Gilks et al., 1996; Van Dyk and Meng, 2001). One of our main goals here is again to build reliable and flexible software that can be utilized for multiple imputation tasks for similar type of survey problems.

Expected outcomes of the NLAAS

The NLAAS has the potential to contribute some of the most important information to the field of psychiatric epidemiology. Prevalence estimates of psychiatric disorders of Latinos from the Los Angeles ECA and the MAPSS have been considered to be similar in that immigrants had lower rates than those reported in the NCS (Vega et al., 1998). Some investigators hypothesized that these differences were due to the lack of Spanish interviewing in the NCS, which may have excluded less acculturated Latinos and recent immigrants who tend to have lower rates of psychiatric disorders. Consequently, prevalence estimates from national studies that only include English speakers may be inflated compared to those that include non-English speakers. The limitations of interpreting national prevalence estimates for Latinos and Asians with only English respondents are confirmed by recent secondary analyses conducted on NCS data that stratified by nativity and found that Mexican Americans born in Mexico had lower rates of psychiatric disorders than those born in the US. The NLAAS will allow us to estimate prevalence rates and service use patterns for a national sample of Latinos and Asian Americans including non-English speakers.

Furthermore, studies have consistently found that the prevalence of various psychiatric disorders between Asian and Latino immigrants is lower than that for US-born Asians and Latinos and the general US population (Burnam et al, 1984; Vega et al., 1998). However, these results refer mostly to Mexican Americans, without information regarding whether the same relationships will be found with other immigrant ethnic groups. The availability of eight subethnic groups in the NLAAS will enable us to test whether the immigrant paradox (that despite disadvantages associated with immigration and acculturative processes, foreign nativity combined with lower levels of acculturation is protective against psychiatric disorders) is evidenced for groups other than Mexican Americans. Various hypotheses have been posed to explain the apparent paradoxical association between immigration status and psychiatric disorders, including selection mechanisms, acculturation, and theories of relative deprivation (Shrout et al., 1992). Additional explanations may include differences in cultural expressions of distress (Golding et al., 1990). With the NLAAS, we will be in a position to examine several of the proposed hypotheses regarding the immigrant paradox and whether differences are observed by ethnic subgroup. Some of the questions we seek to answer are:

- Is time of exposure to US culture linearly related to increase risk for psychiatric disorders?
- Is the relationship of exposure to US culture uniform across all sub-ethnic groups?
- What acculturation experiences might best explain this increased risk for psychopathology?

Additionally, investigators have challenged the notion of systematic response bias according to acculturation as not likely and unsupported by the literature (Escobar et al., 2000). Other investigation suggests that disparities in psychiatric disorders by nativity are not merely the artifact of the language in which the interview was conducted. However, the response to the items, particularly the diagnostic stem questions may vary by ethnic sub-groups (such as Mexican, Puerto Rican, Vietnamese, or other Asian) or by nativity (Alegria and McGuire, 2003), potentially affecting the prevalence rates. The NLAAS data will allow us to examine whether certain groups respond differently to the stem questions and whether this has to do with endorsing the items at different severity thresholds. We will examine the CIDI screener item data using psychometric models that posit latent individual differences. Two perspectives will be explored, one assuming latent dimensional differences and one assuming latent class differences. Both of these approaches explore the probability of item endorsement conditional on the level of a latent variable. In both approaches, we would first determine if there is evidence of one or more latent dimensions accounting for the associations among the item responses. We would use exploratory factor models that are appropriate for binary response data, such as the TESTFACT program implementing the methods of Gibbons and Hedeker (1992, 1997). Items that are related to a single latent dimension would be examined using two parameter logistic latent trait models (MULTILOG program of Thissen) or probit-based factor analysis such as MPLUS (Muthen, 2003). We would test whether the item response functions are the same for Latino, Asian American and European American groups using procedures that have been described by Reise, Widaman and Pugh (1993). If there are differences in the item intercept, it means that one of the groups is more likely to respond to the item (holding constant latent severity) than another group. If there is a difference in the item slope (or factor loading) it means that the relation of the item to the latent severity dimension differs across groups.

In conclusion, the NLAAS is expected to provide the foundation for generating empirical knowledge for improving the mental health care services for Latinos and Asian Americans in the United States. It will be one of the richest data sets for critical examination of the culturally and contextual differences that should be taken into account when planning, implementing and assessing mental health care services and policies affecting these populations. Having the capacity to target Latino and Asian groups at higher risk of psychiatric disorder and dysfunction and reformulate diagnostic profiles that better match the sub-ethnic populations of interest will be some of the contributions of the NLAAS.

At the same time, this is the type of evidence needed to gauge the prevalence of racial and ethnic disparities linked to psychiatric disorders and the access to mental health care. As we confront a more diverse and multicultural population in the next century, strategies and approaches to respond to their particular mental health care needs will be salient. Recommending enhancements to existing diagnostic systems and obtaining accurate information on the institutional and policy barriers tied to service disparities will be paramount. The NLAAS data will be one of the best sources of information to shape those strategies and identify the barriers.

The NLAAS will also serve in other important ways. The collaborations and networks of investigators surrounding the study create an interconnection of knowledge to debate and dialogue some of the most contested issues in the field. In the presence of access and interconnection of this type of diagnostic, conceptual and methodological information, the field of psychiatric epidemiology may enter a new era of no longer seeing minorities as an inclusion group in epidemiological surveys but as the main study focus. As the central topic of analyses, information on the differences and similarities in psychiatric illness, service patterns, barriers to care, functioning, chronic conditions, and social circumstances of Latinos and Asians will be seen from the perspective of unique social experience and need rather than as a comparative group. This type of information will be indispensable to leverage resources and craft services geared to these populations.

The structure of the NLAAS network of investigators promotes not only diffusion of knowledge among senior researchers but also with students and more junior investigators interested in Latino and Asian

American populations. As such, the NLAAS serves as a training tool and a shared data resource. As the psychiatric epidemiology and the mental health services area seeks to attract, train and develop a new generation of young investigators interested in minority populations, the NLAAS will be an important medium to do it.

Acknowledgements

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