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NIH Proposal: Public Health Financing Policy and Preventable Health Disparities

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A. SPECIFIC AIMS

Preventable health conditions account for more than 75% of the $2.7 trillion spent annually on health care in the U.S.,[1] yet only about 3% of these expenditures are devoted to public health programs and services that are designed to prevent and control disease and injury rather than to treat the downstream consequences of these conditions.[2] Such limited investments in public health appear to contribute to the higher rates of preventable mortality experienced in the U.S. compared to other high-income countries. [3,4] In the U.S., public health programs and services are financed through a patchwork of federal, state, and local funding streams that vary widely across communities and that are often highly unstable over time.[5] More than 80% of governmental public health expenditures derive from state and local sources, which are highly sensitive to economic conditions and which reflect the underlying inequities in household income, housing wealth, and tax revenue across communities.[2] As a consequence, per-capita governmental public health expenditures vary by a factor of 13 between the wealthiest 20% and poorest 20% of communities in the U.S.,[5] and recent research by the investigative team has shown that these spending differences contribute to differences in population health across communities.[6] The extent to which, and mechanisms through which, these financing policies contribute to health disparities and avoidable medical costs in the Appalachian region have not been studied systematically.

The overarching objective of this study is to estimate the effects of federal, state and local public health financing policies on the implementation of evidence-based prevention programs in the Central Appalachia region, and on the resulting health risks, costs, and health outcomes experienced by residents of the region. The study will give special attention to policy effects on the implementation of tobacco prevention, nutrition, and physical activity programs as well as the implementation of strategies to facilitate enrollment in health insurance coverage options. A two-part research design will be employed that includes (1) a longitudinal analysis of how financing policy influences program implementation, risks, and outcomes using a quasi-experimental, difference-in-difference design; and (2) an interorganizational network analysis that explores how financing policy shapes governmental and nongovernmental contributions and partnerships for public health program implementation. The study will focus on the 230 counties located in the Central Appalachia region of eastern Kentucky, eastern Tennessee, southeastern Ohio, and West Virginia. The study will accomplish the following specific aims:

1. Assemble a longitudinal, linked database of multiple, secondary survey and administrative data sources containing county-level measures of local, state, and federal public health funding levels for the years 1993 through 2012, linked with measures of public health program implementation, health risk behaviors, preventable hospitalizations, Medicaid service use and costs, and preventable mortality.
2. Conduct a longitudinal analysis of the impact of financing policies on disparities in public health program implementation, risk behaviors, and preventable mortality between Central Appalachian residents and their U.S. counterparts using a quasi-experimental, difference-in-difference research design.
3. Conduct a longitudinal analysis of the impact of financing policies on disparities in preventable hospitalizations and avoidable Medicaid service use and costs among Central Appalachian residents and their same-state, non-Appalachian counterparts using a quasi-experimental, difference-in-difference research design.
4. Implement a web-based survey of the directors of the 230 local public health agencies in the Central Appalachia region and their 255 in-state, non-Appalachian counterparts to collect detailed measures of funding received for (a) tobacco prevention, (b) nutrition and physical activity, and (c) health insurance outreach and enrollment programs; detailed measures of the number of residents served by these programs (reach); and detailed measures of the governmental and nongovernmental organizations in the community that collaborate in implementing these programs.
5. Conduct an interorganizational network analysis using the survey data to identify (a) the patterns of collaboration among community organizations in implementing public health programs, (b) the degree to which patterns of collaboration vary with public health funding levels and sources in the community, and (c) the degree to which program reach varies with public health funding levels and patterns of collaboration in the community.
6. Generate and disseminate a customized, comparative report of research results for each county in the region that illustrates the potential health and cost effects that could be realized through changes in financing policy and changes in public health collaboration with various community organizations.

B.1 SIGNIFICANCE

Public Health Financing and Health Disparities: Despite devoting far more resources to health services delivery than any other country in the world, the U.S. continues to lag behind many other industrialized nations in population health outcomes ranging from life expectancy at birth and infant mortality to the incidence of preventable chronic diseases.[3,7,8] While there are many factors that likely contribute to this gap between resources and outcomes, one poorly understood mechanism is the allocation of resources to public health activities that are designed to promote health and prevent disease and disability at the population level.[9-12] These activities include efforts to monitor community health status, investigate and control disease outbreaks, educate the public about health risks and prevention strategies, enforce public health laws and regulations such as those concerning tobacco exposure, and inspect and assure the safety and quality of water, food, air and other resources necessary for good health.[13] Although data sources vary, estimates consistently indicate that less than 5 percent of national health spending is devoted to public health activities, while the vast majority of resources are devoted to personal medical services designed to treat the downstream consequences of disease and injury.[14-17] In fact, the U.S. spends more on administrative overhead for medical care and health insurance than it does on public health programs.[2]

Inadequate financing for public health programs and policies poses significant challenges to health disparity reduction efforts in the U.S. Preventable risk factors including smoking, blood pressure, blood glucose, and adiposity account for large shares of the racial, ethnic, and geographic disparities in preventable mortality and morbidity experienced within the U.S. Lowering these risk factors to optimal levels would reduce by 69-80% the disparities observed in cardiovascular disease and diabetes mortality, and by 29-50% the disparities observed in cancer mortality. [18,19] While the number of research-tested, efficacious interventions for reducing these and other preventable risk factors continues to grow, the mechanisms for implementing these interventions on a broad, population-wide basis, particularly for underserved populations, remains limited.[20] The nation's public health infrastructure – including state and local governmental public health agencies and the community organizations with which they partner – plays important roles in implementing prevention programs and policies, particularly for underserved populations. Limited, unstable, and inequitable financing for this infrastructure, however, constrains the delivery capacity for prevention and diminishes its health disparity reduction potential. [5,21,22] In view of these findings, a 2012 consensus study report from the National Academy of Sciences Institute of Medicine recommended that the federal government (a) double its current level of spending on public health and prevention services, (b) retool existing federal financing mechanisms to give state and local agencies greater flexibility in the use of funds for prevention, and (c) expand research to identify effective policy strategies for improving the financing and delivery of public health services. [3]

Public Health Financing in Appalachia: Financing mechanisms for public health and prevention programs are particularly constrained in the Appalachian region. State governments in the Appalachian region, particularly those in Central and South Appalachia, face persistently tight fiscal constraints due to their limited tax bases and relatively high obligations for state Medicaid spending—now the largest single budget item for most of these states. [23] Correspondingly, these states and localities demonstrate some of the lowest levels of per-capita public health spending in the nation,[2] suggesting that the incentives created by federal Medicaid matching funds and other financing policies may combine with tight fiscal environments in Appalachia to "crowd out" the ability of Appalachian state and local governments to invest adequately in public health programs and community-based interventions that address social, economic, and environmental determinants of health disparities. [24] Many state and local governments in the Appalachian region also lack governance and decision-making structures that have been found to facilitate informed public health policy development, such as local and state boards of health with statutory authorization for policy development, community health advisory boards, and cabinet-level public health commissioners. [25] *As a possible consequence, high-impact public health policies such as comprehensive clean indoor air laws and ordinances are less prevalent in the Appalachian region than in other parts of the U.S..*[26] The low levels of state and local financing for public health also limits the capacity for implementing and enforcing health-related policies at the community level.[27] Such unintended effects of financing policies have the potential to trigger new and expanded health inequities as planned federal and state health reforms take effect across the Appalachian region over the next few years, including the Affordable Care Act's Medicaid

expansions, health insurance mandates, payment reform innovations, and Prevention and Public Health Fund programs.

B.2 INNOVATION

Public Health Financing as a Policy Instrument for Disparities. This proposed study, along with our preliminary studies, are unique in their exploration of public health financing mechanisms as potentially powerful determinants of and solutions to health disparities – particularly place-based disparities such as those in Appalachia. The health economics and health policy research fields historically have focused primary attention on medical care financing and delivery policy, where most of the nation's health-related expenditures reside. This study will address important uncertainties and evidence gaps concerning the current and potential roles of public health financing in solving health disparities.

Engagement of Public Health Officials. Our study team is unique in its ability to engage public health system decision-makers at state and local levels from across the Appalachian region in the policy research enterprise using the mechanism of practice-based research networks (PBRNs). By partnering with the national ***Public Health PBRN Program*** funded by the Robert Wood Johnson Foundation since 2008 and based at the University of Kentucky, we will engage large and diverse networks of state and local public health agencies in the design, implementation, and translation of this research project. The PBRN program currently includes participants from more than 1000 state and local public health agencies across the U.S., of which nearly 200 agencies are located in the Central Appalachian regions of Kentucky, Tennessee, and Ohio.[28] These agencies have statutory authority for public health policy development, implementation, and enforcement activities at local and state levels across the region. In addition to governmental public health agencies, these networks include participation from community-based organizations that collaborate in public health programs and policies. The directors of the Tennessee and Kentucky PBRNs, **Paul Erwin, MD,** at the University of Tennessee and **Brandon Hurley, MPH,** at the Kentucky Department for Public Health, will play particularly active roles in the implementation, analysis, and interpretation of this study. These relationships will ensure that our research activities accurately reflect policy dynamics and public health realities across the region, and that our findings can be used readily by public health and policy stakeholders.

Development and Use of Unique, Longitudinal Database on Finance Policies and Effects. This study will make use of and build upon a unique, longitudinal, multi-source, database that we have developed through our preliminary studies on public health financing. The database integrates public health financing data, public health program implementation data, sociodemographic data, and population health risk and health outcome data by place (county) and by year (1993-2013), using multiple federal, state, and local surveys. This resource allows for the estimation of both short-term and longer-run policy effects, and for estimating the comparative effectiveness of policies in different geographic areas and community contexts. We will update and expand upon the earlier versions of this database that were used in our preliminary studies, and in particular we will integrate new longitudinal data on preventable hospitalizations using state hospital discharge data systems in the four-state Appalachian region, and new longitudinal data on Medicaid service use and costs using state Medicaid claims data files from this region.

Novel Policy Translation and Dissemination. In the dissemination phase of our study, we will generate and disseminate a customized, comparative report of research results for each county in the region that illustrates the potential health and cost effects that could be realized through changes in financing policy and changes in the organizations that contribute to public health delivery. We will then use our partnerships with the public health PBRNs and our resources in the ARCHES Collaboration Core to stimulate regional dialogues and conversations about these findings and their policy implications, and to provide technical assistance on policy implementation issues to local and state public health stakeholders.

B.3. APPROACH

Theoretical Framework: Drawing on theories of political economy and political science, the theoretical framework for this investigation presumes that the resources expended for public health activities in a given community are determined through the complex interaction of economic conditions and fiscal capacities, community health needs, delivery system characteristics, and competing policy priorities at local, state, and national levels.[29-31] These resources are transformed into public health activities through ***public health***

delivery systems, which include the array of governmental and private organizations that deliver programs and support actions to improve population health.[32,33] Governmental public health agencies serve as focal points within these systems, but they rely heavily on their abilities to inform and influence the work of others. The effects of public health activities on human health, and their spill-over effects on medical care utilization and costs, are determined by ***fidelity*** to efficacious public health programs and policies, by the ***reach and targeting*** of these activities to populations at risk, and by the ***intensity and duration*** of implementation.[34]

B.3.1 Preliminary Studies

Studies of Variation in Public Health Financing: Public health activities in the U.S. are supported through a patchwork of funding sources and financing arrangements that vary widely across states and communities [35,36]. These arrangements give rise to large geographic disparities in spending for public health activities, even among communities with relatively similar population characteristics and health needs.[16,37] A recent study conducted by Glen Mays (**principal investigator**) and funded through the Robert Wood Johnson Foundation's Changes in Health Care Financing and Organization (HCFO) program estimated that per-capita public health spending varied by a factor of 7 between the top and bottom quintiles of U.S. communities in 2005, even after accounting for observed differences population demographics, socioeconomic status, and disease burden. Many communities depend heavily on local tax bases to support public health activities, suggesting that economically disadvantaged communities may face considerable challenges in supporting a comprehensive array of activities.[38] Nationally, only 16 percent of governmental public health spending is attributable to the federal government [14], indicating that federal expenditures may fail to have an leveling effect on the economic capacity of communities to invest in public health activities. [39]

Studies of Public Health Financing and Service Delivery: Community-level differences in public health spending may have important implications for the types of public health activities undertaken within communities and the extent to which these activities reach populations in need. Indeed, several cross-sectional studies conducted by the PI Glen Mays and funded by CDC have found positive associations between public health spending and the scope of public health activities performed within communities [21,40]. Nevertheless, it is possible that differences in spending result at least in part from factors that have little if any impact on service delivery and downstream health outcomes. For example, research by the proposed PI Glen Mays and others has shown that in some communities nongovernmental organizations play important roles in performing selected public health activities, potentially reducing the need for governmental spending.[41-45] Conversely, governmental public health agencies in some communities provide a broad range of services beyond population-based public health activities, including the delivery of medical care and social services. [46] In such communities, high levels of spending by local public health agencies may not necessarily indicate high levels of investment in public health activities designed to promote health and prevent disease and disability on a population-wide basis. [22,47]

Studies of Efficiency in Public Health Delivery: Finally, local public health agencies may vary considerably in how efficiently resources are used, resulting in widely different spending levels required to produce a given set of public health activities and outcomes. Research by Mays and others indicate that agencies serving larger population sizes realize economies of scale in performing activities that require large fixed costs, such as surveillance systems and laboratory tests.[22,48,49] These costs can be spread over relatively large numbers of residents and taxpayers. Conversely, agencies serving rural jurisdictions with low population densities may spend more per capita to perform epidemiological investigations, public health education campaigns, or tobacco control enforcement actions compared with agencies serving geographically concentrated populations.[47] A recent study completed by the investigative team demonstrates that the movement to regionalized service delivery arrangements among small and rural public health agencies allows these agencies to realize ***economies of scale*** and ***economies of scope*** in the delivery of public health services, and to realize efficiencies through ***network effects*** that accrue via partnerships with other community organizations.[22] Collectively, these findings indicate that financing policies have differential effects on local public health delivery systems based on their size, scope of activities, and interorganizational relationships (networks).

Studies of Public Health Financing and Health Outcomes: Until recently, very little empirical evidence existed about the extent to which differences in public health spending levels contribute to differences in population health.[50] Several cross-national studies have found weak and conflicting associations between

spending and health outcomes when measured at a national level. [51-53] In the U.S., several time-series studies have examined associations between spending levels and health outcomes for specific types of programs such as those targeting HIV prevention, sexually transmitted disease prevention, and tobacco control, finding that disease incidence and/or harmful behaviors declined as expected in response to funding increases .[54-58] These studies and related literature on the cost-effectiveness of individual health promotion and disease prevention interventions suggest that some—though certainly not all—public health activities provide reasonable value for the money devoted to them.[59-61] However, until very recently there has been little empirical research that investigates the value of investments in the public health system as a whole and in the delivery systems and infrastructure that enable public health programs and services to reach populations at risk.[20,33] A recent study by PI Glen Mays and colleagues found significant and sizable effect of per-capita public health spending levels on several measures of preventable mortality, including infant mortality and deaths due to cardiovascular disease, diabetes, and cancer. Using a quasi-experimental, instrumental variables method to control for unmeasured confounding and support causal inferences, estimates suggested that mortality rates fell by between 1.1% and 6.9% for each 10 percent increase in spending over the 1993-2005 period of study. [6] A similar study by **Paul Erwin** (ARCHES consultant), Mays and colleagues found similar patterns of association between spending and outcomes at the state level. [62] Yet another study found preliminary evidence suggesting that local public health spending growth during the 1990-1997 period was associated with reductions in racial disparities in mortality for selected age groups. [63] These preliminary studies highlight the need for further and more definitive research to investigate the effects of public health spending on inequities in population health and to elucidate the delivery system mechanisms, domains of activity, and target populations through which these effects occur.

Studies of Public Health Financing and Medical Care Use and Costs. A related empirical question of considerable policy interest involves the extent to which public health resources and delivery systems can offset the need for and use of medical care, thereby producing savings or cost offsets that can help to constrain overall health system spending.[5] Preliminary research by Mays and others using data on area-level Medicare costs from the Dartmouth Atlas of Health Care show that communities that increased public health spending during the 1993-2008 period experienced small but significant reductions in the growth of Medicare service use and expenditures compared to other communities, suggesting that 80-90% of the incremental costs for public health spending were recouped through Medicare cost savings over the study period. [5,64] Similar research using Medicaid service use and costs has not been conducted, but it is needed to allow examination of the economic benefits and costs of public health financing policies for state government and health system stakeholders, particularly in the Central Appalachian states where Medicaid costs dominate state budgets and "crowd out" spending on other social programs relevant to health disparities. Expanded research on the economic effects of public health financing and health disparities is need to inform governmental policy decision-making in the Appalachian region and provide additional impetus for disparities reduction. ***The proposed investigation will assemble a unique longitudinal data set and apply novel econometric modeling strategies to address these research needs.***

B3.2. Research Design and Methods

Overview. This study will use a quasi-experimental research design to estimate the effects of public health financing policy on the local implementation of public health programs, the prevalence of health risks, and the incidence of preventable morbidity and mortality at the community level in the Central Appalachian region. Following the research design used in our preliminary studies, we exploit natural experiments created by extensive cross-sectional and longitudinal variation in public health spending at community levels both within the Central Appalachian region and between the region and other U.S. communities. We will update and expand the multiple archival data sources assembled through our preliminary studies in order to construct a unique, 20-year panel of data on governmental public health financing and outcomes over the time period 1993 to 2013. In addition to retrospective secondary data analyses, we will prospectively collect primary data on more detailed measures of public health program implementation and community organization contributions in Central Appalachian counties to assess the specific roles of service delivery and interorganizational networks in mediating the observed effects of spending on preventable medical care and health outcomes. Estimates from these analyses will be used in simulation models to project the effects of alternative local, state, and federal public health financing policies on (1) the implementation of public health programs; (2) offsets in medical care utilization and costs; and (3) preventable mortality and life years gained in the region.

Research Questions and Hypotheses. Research questions to be examined through this investigation include:

- How do the levels and sources of public health financing in Appalachian communities compare to those in non-Appalachian communities, and how have these regional spending differences changed over time?
- To what extent do demographic characteristics, socioeconomic factors, disease burden levels, and governance and political decision-making structures account for differences in the public health expenditures of Appalachian and non-Appalachian communities?
- How have changes in public health expenditures during 1993-2013 influenced changes in the implementation of public health programs, changes in the health risks of residents, and changes in preventable disease burden and mortality rates in Appalachian communities, compared to non-Appalachian communities?
- How have changes in public health expenditures during 1993-2013 influenced changes in preventable hospitalizations, and changes in Medicare and Medicaid service utilization and expenditures, in Appalachian communities compared to non-Appalachian communities?
- How do the levels and sources of public health financing influence the implementation of public health programs that promote tobacco prevention, nutrition, physical activity, and insurance enrollment? Which specific types of programs demonstrate greatest sensitivity to spending levels and sources?
- How do the levels and sources of public health financing influence the extent to which other community organizations contribute to the implementation of public health programs?

Specific hypotheses to be tested include:

H1: Appalachian communities experience slower rates of growth in public health spending compared to their U.S. counterparts, contributing to higher rates of health risks, preventable diseases, preventable hospitalizations and preventable mortality.

H2: Slower rates of growth in public health spending in Appalachian communities contribute to faster growth in Medicare and Medicaid service utilization and expenditures.

H3: Slower rates of growth in public health spending in Appalachian communities contributes to poorer reach and fidelity in the implementation of tobacco prevention, nutrition, physical activity, and health insurance outreach and enrollment activities.

Research Design and Study Population. This investigation will employ a longitudinal, retrospective cohort design to analyze changes in spending patterns and population health within communities served by the nation's approximately 2800 local public health agencies between 1990 and 2013. The study will focus on spending at the local level because local public health agencies—rather than their state and federal counterparts—assume primary responsibility for directly implementing public health activities in most communities [65,66]. Most federal and state grants for public health activities, and significant private funding, are channeled through local public health agencies [21,37]. Moreover, these agencies frequently work to mobilize and coordinate the public health activities of other organizations in the community.[67,68] As such, these agencies provide valuable settings in which to study the determinants and consequences of public health spending in the U.S. The study population will include service areas of all agencies operating during this time period that meet the National Association of County and City Health Officials' (NACCHO) definition of a local health department: an administrative or service unit of a local or state government that has responsibility for performing public health functions for a geopolitical jurisdiction smaller than a state.[37] In 2010, approximately 2890 agencies met this definition, of which 73 percent served county jurisdictions or combined city-county jurisdictions, with the remaining agencies serving city or township jurisdictions (16%) or multi-county or regional jurisdictions (11%).

This study will focus on the 230 counties located in the Central Appalachia region of eastern Kentucky, eastern Tennessee, southeastern Ohio, and West Virginia. To estimate the place-based disparities experienced by residents of this region, three different comparison groups of communities will be used: (1) a within-state comparison group comprised of the 265 counties located within the same four states but outside of the Appalachian region; (2) a within-region comparison group comprised of the remaining 180 counties in the Appalachian region outside the Central subregion; and (3) a national comparison group comprised of the remaining 2215 counties located in the lower 48 states but outside of the Appalachian region. Subgroups of communities within these three strata will also be studied, including groups of communities based on socioeconomic status, racial and ethnic composition, population size and rurality.

Community and Policy Advisory Board. Members of the ARCHES Community and Policy Advisory Board will be convened to review study plans and provide input into the final selection and construction of measures, analysis plans, and plans for customized results dissemination and policy translation. Members of the Board will include state and local public health officials participating in the public health PBRNs from the Appalachian region. The Community Advisory Board will convene twice a year throughout the project, initially providing guidance on recruitment and training needs, and later on implementation, interpretation, and translation of results to policy implications.

Data Sources and Construction of Longitudinal Linked Database. Multiple archival data sources will be used to construct a unique, 20-year panel of data on governmental public health spending, service delivery measures, population and socioeconomic characteristics, and community-level health outcomes over the time period 1993 to 2013. *All of these data sources except those based on hospital and Medicaid administrative data from the four Central Appalachian states already have been integrated into the panel database for years 1993-2008 through work under previous studies by the PI.* The current study will need only to update the database with more recent available data through calendar year 2013, and then add in new data elements from hospital and Medicaid sources (described below). The National Association of County and City Health Officials (NACCHO) has collected expenditure data along with organizational and operational characteristics of local public health agencies nationwide through periodic census surveys fielded in 1993, 1997, 2005, 2008, 2010, and 2013. Response rates have varied between 72% and 88% each year, with responding agencies covering more than 90% of the U.S. population each year. While the content of the survey has changed considerably from year to year, a core set of variables reflecting annual agency expenditures, revenues by source, jurisdiction size, programs and services offered, and staffing levels were collected in each year of the survey. Recent studies by Mays linked observations across the 1993, 1997, 2005, and 2008 surveys using identifying information on each public health agency and public records and agency contacts to account for agency mergers, closures, and service area changes.[5] This same method will be used to link the 2010, and 2013 surveys.

Using identifying information about each local public health agency's jurisdiction and the county or counties in which it operates, we will link NACCHO survey observations with contemporaneous information from multiple other data sources, forming a longitudinal panel database structure. County-level data on population characteristics and health resources will be obtained from the *Area Resource File*, a collection of more than 50 data sources including the American Medical Association Physician Masterfile, the American Hospital Association Annual Hospital Survey, and U.S. Census Bureau data sources. Annual county-level data reflecting direct federal public health expenditures will be constructed from the *Census Bureau's Consolidated Federal Funds Report* (CFFR). Data on state and local government public health and health care expenditures will be obtained from the U.S. Census Bureau's 1993, 1997, 2002, 2007, and 2012 *Census of Governments* (COG) using expenditure function category 32 to distinguish public health spending from hospital care and most other medical care expenditures. County-level economic data on employment, payroll, and firm size will be obtained from the Census Bureau's *County Business Patterns* series. County-level, cause-specific mortality data will be obtained from the *CDC Compressed Mortality File*. Each county-specific mortality rate will be constructed using two calendar years of data in order to increase statistical precision in small counties. County-level birth outcome data, including teen births, low-birth weight, prenatal care adequacy, and infant mortality, will be obtained from CDC's *National Vital Statistics System*. County-level estimates of health risk behaviors, self-reported disease prevalence, and health-related quality of life (HRQOL) will be generated from the CDC's *Behavioral Risk Factor Surveillance System* (BRFSS) using the Bayesian small-area estimation method developed by CDC, which will use three years of data to produce county-level estimates, centering these estimates around each year of the NACCHO survey data.[69]

Three medical care utilization and spending data sources require special processes for linkage. First, area-level estimates of medical care utilization and expenditures will be obtained from the *Dartmouth Atlas of Health Care*, including total Medicare inpatient and outpatient expenditures per enrollee and Medicare inpatient discharge rates for selected chronic diseases and ambulatory care sensitive conditions. Annual data on the Dartmouth Atlas measures will be available for the period 1994-2013 for each of 3436 hospital service areas (HSAs), which will be linked hierarchically to county-level data elements using information on the counties falling within each HSA. Counties that include parts of multiple HSAs will be linked with weighted averages of HSA measures using the share of the county's population in each HSA as weights. Second, county-level estimates of hospitalization rates for selected chronic diseases, communicable diseases, and injuries

collectively known as preventable hospitalization rates will be obtained from the AHRQ Healthcare Cost and Utilization Project **(HCUP) State Inpatient Databases**, using AHRQ's prevention quality indicators methodology.[70] The number of states for which county-level HCUP measures can be constructed varies by year based on the availability of participating all-payer state hospital discharge data systems that report patient zip code information. Therefore we will obtain and use county-level HCUP measures only for the subset of 4 states represented in the Central Appalachia region (KY, OH, TN, WV); therefore, analyses using these measures as outcomes will not incorporate the national comparison group and will emphasize only the within-state comparisons of Appalachian vs. non-Appalachian communities. Third, county-level estimates of Medicaid service utilization and expenditures will be obtained from the CMS **Medicaid Analytic Extract (MAX) claims files,** again only for the subset of 4 states represented in the Central Appalachia region. Measures of outpatient, inpatient, and prescription drug utilization and expenditures per enrollee, along with total Medicaid expenditures per enrollee, will be constructed, stratified by Medicaid eligibility category, age group, and gender. These last two data sources were not incorporated into previous versions of the longitudinal database and therefore will receive considerable attention during data processing and data quality check phases of file construction. All county-level data will be linked with the NACCHO data using county identifiers and year. For public health agencies serving jurisdictions of more than one county, county-level estimates will be aggregated to the jurisdiction level. For data sources other than the NACCHO data, annual observations will be maintained in the database for all available years during the time period 1993-2013 in order to test alternative lag structures between the public health spending measures and the health risk, outcome and cost measures.

Public Health Financing Measures. The primary independent variables of interest in this analysis will include aggregate and per-capita measures of local public health agency spending, as well as the share of this spending that is derived from local, state, federal and private funding sources. Residual measures of state and federal spending on public health in each county area will also be constructured by using COG and CFFR data and subtracting out local agency revenues received from state and federal sources. Additionally, we will construct a separate measure that approximates local spending only on non-clinical prevention programs and services by multiplying the total public health agency expenditure measure by one minus the proportion of each agency's revenue obtained from medical care payment sources (e.g. Medicaid, Medicare, and private insurance reimbursements). Both nominal and inflation-adjusted spending measures will be analyzed and tested in sensitivity analyses.

Population Health Measures. For the health-related dependent variables used in this analysis, we select population health measures that are routinely collected from public health surveillance systems, available at the local (county) level, and that are expected to be sensitive to public health interventions over the 20-year period of study [71,72]. Based on these criteria, we select the infant mortality rate; the cause-specific mortality rates for heart disease, cancer, diabetes, and influenza; the teen birth rate and low-birth weight rate; adult overweight, obesity, and diabetes prevalence rates; and adult health behavior measures reflecting self-reported physical activity, fruit and vegetable consumption, cancer screening, and smoking prevalence. Two additional mortality measures are selected as control conditions—mortality from Alzheimer's disease and a measure of residual mortality not attributable to preventable chronic diseases, influenza, or unintentional injuries—based on the hypothesis that these deaths should not be influenced by public health resources and interventions over the period of study. All mortality rates used in the analysis will be age-adjusted based on the national age distribution from the 2000 U.S. Census. Mortality and birth outcomes measures will be constructed using two years of data to improve stability of rates in small counties.

Measures of Medical Care Resource Use. Measures of medical care use and spending from the Dartmouth Atlas reflect the experience of Medicare fee-for-service beneficiaries and therefore are considered approximations of overall medical utilization in local areas. Medicare spending accounted for about 20% of total personal health care spending nationally in 2010. Measures of preventable hospitalizations reflect the experience of all patients regardless of payment source, but are limited to the 4 Central Appalachian states. We will use hospitalization measures expected to be sensitive to public health resources and interventions, including measures for uncontrolled diabetes, pneumonia, influenza, asthma, hypertension, and "all cause" preventable hospitalizations. Separate rates of hospitalization among the uninsured will be computed because of their particular vulnerabilities to health disparities and their policy salience as a source of uncompensated care costs for hospitals. Measures of Medicaid utilization and expenditures per enrollee will be constructed separately for population groups segmented by life stages frequently targeted by public health resources and

interventions, including infants (<1 year), children (1-12 years), adolescents (13-17 years), women of childbearing age (13-45 years), disabled adults (18-64 years), non-disabled adults (18-64 years), and seniors (65+ years). Special populations identified by Medicaid eligibility category also will be examined separately, including pregnant women, dual-eligibles (Medicare and Medicaid), Children with Special Health Care Needs (CSCN) and foster children. Measures will be constructed using two years of data to improve stability of measures in small counties.

Primary Data Collection of Program Implementation Measures. Measures of the scope of public health programs offered by local public health agencies will be constructed from NACCHO survey data in each of the survey years 1993-2013. These measures indicate whether or not a list of approximately 70 discrete public health programs and services are offered by each agency in each year, including smoking cessation screening, breast and cervical cancer screening, childhood and adult vaccination, sexually transmitted disease control, diabetes self-management, and many other programs. Additionally, we will prospectively collect primary data on more detailed measures of public health program implementation, reach, and fidelity in order to assess the specific roles of service delivery in mediating the effects of spending on preventable medical care and health outcomes. An annual, ***web-based survey of local public health agency directors*** will be fielded during 2014, 2015, and 2016 to capture detailed measures of (1) the programs implemented in the community for (a) tobacco prevention, (b) nutrition and physical activity, and (c) health insurance outreach and enrollment programs; (2) detailed measures of the number of residents served by each of these programs (reach); (3) detailed measures of the funding received for each program by source (federal, state, local, and private); and (4) detailed measures of the governmental and nongovernmental organizations in the community that contribute to implementing these programs. Survey items measuring program implementation, reach, and fidelity will be based on instruments developed and validated by Brownson et al.[73,74] and by Slater et al.[75] for use with public health agencies. Items measuring community organization contributions to program implementation will be based on an instrument developed and validated by the PI (Mays) and colleagues and used since 1998 as a longitudinal survey of a national sample of local public health delivery systems.[76,77]

To parallel the data structure and comparisons that will be used in the retrospective component of this study, a ***four-strata sample*** will be used for this prospective survey that includes the local public health agencies serving: (1) all 230 counties in the four-state Central Appalachian region; (2) all 265 counties located within the same four states but outside of the Appalachian region; (3) all of the remaining 180 counties in the Appalachian region outside the Central subregion; and (4) a 20% sample of the agencies serving the remaining 2215 counties located in the lower 48 states but outside of the Appalachian region, stratified by population size and rurality. The survey instrument will be programed for web-based self-administration using REDCAP software, designed for completion in approximately 30 minutes, and structured so that respondents can save and complete the instrument at a later time if they need to consult with other agency staff about specific program measures. An introductory letter will be mailed and emailed to each agency's chief executive to recruit survey participants, followed by a telephone call from study staff. Representatives from the public health PBRNs in each state will help to recruit survey respondents and follow-up with non-responding agencies each year, in addition to research staff follow-up. A small completion incentive will be offered for participants each year, and all respondents will receive a customized, comparative report of results. Non-responding agencies will be contacted by telephone at least three times and also mailed hard copies of the survey as an alternative completion option. A twelve-week data collection window will be used each year, and a minimum response rate of 85% is expected based on our successful record of fielding public health agency surveys.

Interorganizational Network Measures. Web-based survey items measuring community organization contributions to program implementation will be used to construct measures of interorganizational network structures that characterize the types of relationships that exist among organizations engaged in public health program implementation at the community level. We will construct measures commonly used in network analysis, including: the overall ***density*** of organizations contributing to the tobacco, nutrition, physical activity, and health insurance outreach programs in each community; and the connectedness and influence of these organizations as measured by ***degree centrality***, ***betweenness centrality*** , and ***average path length*** measures for each organization and for each community as a whole. [78] Importantly, all of the network measures we use will reflect an ego-network perspective, meaning that information about which organizations contribute to which programs are based on the perspective of only one actor in each community: the local public health agency who responds to the survey. Prior research conducted by the research team has found

local public health agency directors to be highly accurate in reporting on program contributions made by other organizations in their same community.[40]

Sample Size and Power Calculations. Power calculations for the retrospective, longitudinal component of the study are based on data from our preliminary study of financing and health outcomes during the 1993-2005 period.[6] The sample size will comprise 230 counties in the Central Appalachian region, 265 counties in the within-state comparison group, 180 counties in the within-region comparison group, and 1850 counties in the outside-region comparison group. A total of six waves of repeated measures will exist for each county over the 1993-2013 period. This design achieves 90% power to detect the following changes in cancer mortality per $10 change in per-capita public health spending: 0.85 deaths per 100,000 residents in the Central Appalachian region; 0.74 deaths per 100,000 residents in the within-state comparison group; 0.91 deaths per 100,000 residents in the within-region comparison group; and 0.32 deaths per 100,000 in the outside-region comparison group. These calculations are based on a two-sided test (p=0.05) with an observed standard deviation of 55.7 for the cancer mortality rate and 43.6 for the level of public health spending per capita, with a repeated measure correlation of 0.3. These minimum detectible effects are more than adequate to detect the effect sizes observed in our preliminary study of 2.7 deaths per 100,000 over a shorter, 15-year period, especially after performing multivariate adjustments. These estimates also indicate that for the prospective survey data collection, a 20% sample in the out-side region comparison group will be adequate to detect differences between Central Appalachian and non-Appalachian communities, with a minimum detectable difference of 0.61 deaths per 100,000 residents between these groups based on the distributional parameters above.

Retrospective Data Analysis. All study variables will be evaluated through a series of data quality assessments, range checks, and trend analyses to detect anomalies and outlier values. After completing preliminary bivariate analyses, we will use multivariate regression models for panel data to estimate the magnitude of disparities in public health spending levels and funding sources between Central Appalachian communities and their comparison group communities, to analyze whether these disparities grow or decline over time, and to identify how much of these disparities are explained by community demographics, socioeconomic conditions, health system characteristics, and community health needs. Generalized estimating equation models will be used for these analyses in order to examine both time invariant and time varying covariates while also addressing autocorrelation and clustering of communities within states. Interaction terms between covariates and comparison group variables will be used to test for effect modification based on geographic location within Appalachia.

Next, panel data models will be used to estimate relationships between public health expenditures and each outcome measure of interest, while using a rich set of covariates to control for confounding economic, demographic, and health system factors. Our initial analyses will use fixed-effect models to address autocorrelation and control for potential confounding due to unmeasured, time-invariant characteristics of communities, and robust standard errors will be employed to address clustering of communities within states. Because public health programs and resources are likely to have delayed effects on health-related outcomes, particularly for chronic diseases, we will test various lag model structures and use specification tests to determine the most appropriate delay between expenditures and the outcomes of interest.

For our preferred analyses, we will use an instrumental variables design to further reduce the risk of endogeneity bias and unmeasured confounding, recognizing that imperfectly measured factors such as local economic conditions and community health risks may jointly influence public health spending levels and the outcome measures of interest. To address this possibility, we will use a set of variables that are expected to introduce exogenous variation in public health spending but to have no direct relationship with the outcome variables in this study. These variables "mimic" the process of randomization by naturally assigning communities to different levels of spending using a mechanism that is uncorrelated with the outcomes.[79] We will use several governance and administrative characteristics for this purpose that reflect the political economy of local public health resource decision-making, specifically degree to which decisions about public health actions and resources are controlled by public health agencies vs. governing boards vs. elected officials at state vs. local levels. These instrumental variables include: (1) whether the local public health agency is governed by a local board of health with policy-making authority, (2) whether the agency operates as a

centralized unit of state government; (3) whether the state or the local government has the authority to approve the local public health agency budget; and (4) whether the local government and/or local board of health have the authority to establish public health fees and/or dedicated tax levies. Local governing boards of health are hypothesized to generate enhanced public and political support for local public health agencies, because their membership frequently includes individuals who have political access, professional credibility, and/or technical expertise that can be used to attract and maintain resources. Several prior studies have found evidence of higher levels of spending and performance among local public health agencies that are governed by local boards of health [22,40]. Conversely, spending is expected to be lower among local public health agencies that operate under the centralized control of state government agencies. These agencies are hypothesized to have less autonomy and administrative flexibility to seek outside sources of support, and less ability to tap local sources of funding, than their counterparts that operate as decentralized units of local government.[66] Specification tests [80] will be used to indicate whether the instruments are uncorrelated with the outcomes of interest, including measures of preventable mortality, chronic disease burden risk factor prevalence, and medical care utilization and costs. ***If so, our analysis will provide a quasi-experimental method of supporting causal inferences about the effects of public health financing on health in the region.***

Effect modification tests will be used to evaluate whether public health spending levels and sources have differential effects on outcomes in the Central Appalachia region compared to the comparison group communities. Moreover, decomposition analysis will be used with the instrumental variables model to estimate what proportion of the disparity observed between Appalachian and non-Appalachian communities is attributable to public health financing policy. Simulations with estimates from these models will be used to evaluate the types of changes in spending levels and sources that would be required to eliminate the observed regional disparities in the outcomes of interest. This same modeling and estimation strategy will be repeated for each outcome of interest (risk factor measures, morbidity measures, mortality measures, Medicaid and Medicare utilization and cost measures), modifying the approach only to accommodate dichotomous outcomes with logistic rather than Gaussian functional forms.

Prospective Data Analysis. We will analyze the survey data collected prospectively during Years 1-3 using a parallel set of panel data models and estimation strategies. A key distinction from the retrospective analyses is that our prospective data will reveal much more proximate relationships between financing, program implementation and interorganizational relationships, within a maximum 3 year time period. These analyses will offer a view "inside the black box" of how funding is transformed into public health action. We anticipate that GEE models will perform better than fixed effects models with these data given the short panel length. A key relationship of interest to be analyzed concerns how funding levels and sources interact with the contributions of other organizations in the community to influence levels of program implementation. Interaction terms will be used to assess whether funding streams and interorganizational efforts are complements or substitutes in their relationship to program implementation. The analysis will also examine patterns of program implementation across the four domains of public health activity (tobacco prevention, nutrition, physical activity, and health insurance outreach), providing insight into which domains are most severely underperformed within the region and whether new financing policies and interorganizational efforts can close any gaps.

Dissemination and Policy Translation. In the dissemination phase of our study, we will generate a customized, comparative report of research results for each county in the region that illustrates the potential health and cost effects that could be realized through changes in financing policy and changes in the organizations that contribute to public health delivery. Each report will compare an agency's individual responses on the prospective survey to averages from the within state, within region, and national comparison groups. Key findings from the retrospective analysis will also be included on the report, along with simulation results that illustrate the changes in public health financing that would be required to reduce or eliminate disparities across the region. After reports have been disseminated to respondents electronically, we will organize a webinar that profiles strategies for using the report for policy and practice applications. We will also work with colleagues in the public health PBRNs and our resources in the ARCHES Collaboration Core to stimulate regional dialogues and conversations about these findings and their policy implications, and to provide technical assistance on policy implementation issues to local and state public health stakeholders.

To this end, we will organize an in-person policy briefing in each of the four Central Appalachian states that are the focus of this analysis, to review study findings and policy simulation results, synthesize these findings with prior studies, and discuss policy implications and opportunities that derive from the study. We will include the ability to conduct interactive policy simulations using input from briefing participants as part of these events, such as simulating the effects of changes in financing policy suggested by participants. We will follow the same process and format that is proposed for the policy translation briefings described in the ARCHES Administrative Core, including briefing locations, audiences, and sponsors, and we will work closely with the PBRN leadership and Administrative Core leadership to organize these translation events. Project consultants Dr. Paul Erwin and Brandon Hurley, two experienced PBRN leaders, will be actively involved in planning and implementing these events.

B.3.3 Potential Problems, Alternative Solutions, and, Measures of Success

Potential problems we anticipate in this study include: (1) the instrumental variables analysis fails because of weak instrument correlation or non-excludability; (2) county level estimates of health risks from the BRFSS prove too unstable for meaningful analysis; and (3) insufficient response rates are achieved in the prospective survey. Under the first scenario, we will seek to employ an alternative quasi-experimental method such as propensity score analysis that does not rely on instruments. In scenario two, we will seek more stable estimates by aggregating data across larger numbers of years, taking care to aggregate in ways that preserve the assumed lag structure as closely as possible. For scenario three, our first step would be to contact the membership of our PBRNS to seek their advice and guidance in increasing response rates. Personal emails and phone calls from peer agencies can increase response rates significantly in our experience, as can our commitment to providing customized, comparative reports of results to all participants.

Project success will be measured principally our ability to obtain robust and reasonably precise estimates of the effects of public health financing policy on disparities in program implementation, population health, and costs in the Central Appalachian region. Stakeholder interest in and use of these results will also be used as measures of success, as signaled by stakeholder responses to the customized reports and policy briefings implemented during the translational phase of the project.

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D. PROTECTION OF HUMAN SUBJECTS

Most of the data sources used in this analysis contain information aggregated at the county level and do not contain protected health information (PHI) or other information that could present risks to human subjects. However, person-level health information will be included in the retrospective data sources from the HCUP hospital discharge data and the Medicaid Analytic Extract (MAX) claims files used for analysis. In both cases we will request and obtain data files with all personal identifying information removed except county of residence, which is required for data linkage. In these cases we will request and obtain limited data sets and enter into a data use agreement with the federal data suppliers for the use of these data.

For the prospective data collected through surveys of local public health agency officials in this study, all data obtained through the survey reflect actions taken by the agencies as part of their statutory governmental responsibilities as public health authorities. No person-level information will be collected except for the name and contact information for each responding agency official, which is used solely for longitudinal tracking and follow-up with survey respondents and provision of survey results to participants.

Risks to Human Subjects: The risks presented by the study to participants are very minimal. In the case of HCUP and MAX health data, county identifiers are the only PHI to be obtained, making disclosure of identifiable information unlikely. Nevertheless, disclosure of the information related to diagnoses and health care remains possible, particularly in small counties and for people with relatively rare conditions and

characteristics in those counties, and use could result in harm to the reputation or employability of individuals in the study and in psychological distress.

Protection Against Risks: Steps will be taken throughout the research process to minimize the risk of unintentional disclosure of information from the HCUP and MAX sources. All person-level data files containing the county identifiers will be maintained on a single, encrypted server kept in locked and secured data center at the University of Kentucky at all times, and accessible only to members of the research team via password-protected server access. Once the raw data files are obtained from the federal suppliers, data processes will be implemented rapidly to construct the aggregate measures of health care utilization and spending by county, after which all person-specific raw data will be permanently deleted from servers. We will use standard data suppression techniques for small areas such that measures that have fewer than 30 cases for an individual county will be reassigned to missing values, preventing the possibility of re-identification. All county-level analytic files will continue to be maintained on encrypted and password-protected computers and servers accessible only to research study personnel.

In the unlikely event of disclosure of information, the event will be immediately reported to the IRB and to NIH to ensure proper oversight for the protection of human subjects.

Benefits of the Research to Participants and Others. No direct benefits will accrue to the individuals represented in the HCUP and MAX retrospective data sources. However, the study has the potential to reveal how public health financing policies can be used to improve health and lower health care costs in the Appalachian region, potentially leading to beneficial changes in policy within the region, in other states, and at the federal level. The value of the knowledge to be gained from this research is considerable given its potential public health and economic implications on a broad, population-wide basis.

E. INCLUSION OF WOMEN AND MINORITIES

Both men and women are included in the retrospective analysis component of the study, as are racial and ethnic minority populations residing in the Appalachian region and in the national comparison groups. Our study will include analyses that test for gender, race, and ethnicity-based differences in how public health financing policies influence health status and regional health disparities. Despite the relatively homogeneous racial and ethnic composition found in the region, every effort will be made to identify findings and policy implications that apply specifically to racial and ethnic minority populations and to women.

F. INCLUSION OF CHILDREN

Children will be included in some of the data sources used for this analysis, including mortality measures, preventable hospitalization measures, and Medicaid service use and cost measures. Where sufficient cases allow, we will analyze the effects of public health financing policies specifically on children, particularly when using Medicaid data on service use and costs where the number of children included will be substantial. Our analyses that focus on infant mortality as a population health outcome measure will specifically address child health.

G. VERTEBRATE ANIMALS

This program does not involve research on vertebrate animals.

H. SELECT AGENT RESEARCH

This program does not involve research with select agents.

I. MULTIPLE PI/PD LEADERSHIP PLAN

Not applicable.

J. CONSORTIUM/CONTRACTUAL ARRANGEMENTS

The Overall Core does not require new programmatic, fiscal, and administrative arrangements to be established between the University of Kentucky and external consortium organizations to support the proposed ARCHES center. The external collaborating organizations in the ARCHES center have established existing consortium arrangements with the University of Kentucky through the Appalachian Translational Research Network directed by Dr. Brady Reynolds, and by the Public Health Practice-Based Research Networks Program directed by Dr. Glen Mays, as evidenced by the letters of support from these directors. If the ARCHES center determines during its initial planning year that new consortium arrangements are required with these or other external organizations, these arrangements will be developed and executed prior to the conclusion of the planning period allowed under this funding mechanism.

K. LETTERS OF SUPPORT

Letters of support are provided for key collaborators and consultants in the ARCHES center, including:

- **Mr. Brandon Hurley, MPH,** Director of the Kentucky Public Health Practice-Based Research Network and Director of the Center for Performance Management in the Kentucky Department of Publc Health.
- **Dr. Paul Erwin, MD, DrPH,** Professor and Chair of the Department of Public Health at the University of Tennessee in Knoxville, Tennessee.

These letters are shown with the Overall Component rather than repeated here.

Our plan for addressing dissemination of research findings to collaborators, communities, service providers, and policy makers in the region, consistent with achieving the goals of this program to translate research advances into real-world applications, are outlined as follows.

The Administration Core will launch a tailored suite of communication, dissemination, and technical assistance mechanisms that allow both internal and external stakeholders to stay abreast of and learn from the center's work, while also shaping its research activities through ongoing dialogue. These mechanisms include:

- **The ARCHES Electronic Newsletter** will be published monthly and emailed to all registered partners and affiliates of the ARCHES center. The newsletter will profile major developments in center-supported research, intramural and extramural funding opportunities, relevant policy issues and actions occurring within the Appalachian region, upcoming conferences and meetings, career opportunities at partner organizations related to policy and disparities research, and the release of relevant publications and data resources. Newsletter items will be solicited from all partner organizations each month.
- **The ARCHES Monthly Virtual Meeting and Research-in-Progress Briefing** will be open to all affiliated researchers, PBRN participants, and community and policy stakeholders. This web-assisted meeting will allow partner organizations to discuss their research interests and opportunities related to policy and health disparities in the region, and also give updates on the progress of ongoing research projects. The meeting also will allow Administrative Core staff to give updates on funding opportunities, reporting deadlines, evaluation activities, and other administrative developments. As a regular feature of each meeting, one affiliated partner will give a 15 minute *Research-in-Progress* briefing on an ongoing study, presenting a creative research design, an interesting analytic issue, puzzling preliminary data, exciting emerging findings, or a discussion of how research findings are being translated and used in policy and practice settings. All monthly meetings will be recorded and archived on the ARCHES website for on-demand viewing.
- **The ARCHES Transdisciplinary Research Webinar** will be offered quarterly to provide skill-building and enrichment opportunities for ARCHES stakeholders regarding the design, implementation and translation of policy and disparities research. These 90-minute webinars led by members of the ARCHES Transdisciplinary Research Committee and their designated colleagues will address theoretical and methodological advances relevant to policy and disparities research in Appalachia, with a focus on sharing information and techniques across disciplines and professions. Topics will include theoretical advances, research design considerations, measurement approaches, new data sources, novel analytic approaches, and evolving research translation, dissemination, and implementation models. These sessions also will be archived on the ARCHES website.
- **The Annual ARCHES Symposium** will be held in conjunction with the Keeneland Conference on Public Health Services and Systems Research hosted by the University of Kentucky each April. All research, community, and policy stakeholders affiliated with ARCHES will be invited to a full-day symposium in Lexington, Kentucky that focuses primarily on (1) synthesizing what has been learned from the past year of research on the interplay of policy and health disparities in the region; and (2) identifying newly emerging disparity issues and policy innovations that should receive priority in future ARCHES research initiatives. The symposium will employ a highly interactive format including a town-hall style forum, break-out discussion groups organized by research topical areas, question-and-answer sessions with policy leaders in the region, and electronic stations for submitting research questions and voting on research priorities. By scheduling this symposium to occur just prior to the Keeneland Conference, participants will have the option to participate in this valuable national meeting focused on policy and delivery system research in public health settings.
- **The ARCHES Digital Commons Collaboration Portal** will be developed and launched by the Collaboration Core but will be used actively by the Administrative Core to disseminate information that is broadly relevant to ARCHES stakeholders. This portal provides an electronic platform for posting research protocols, progress reports, guidance documents, working papers, and policy briefs; issuing requests for information calls for collaborators; sharing model policies, laws, and guidelines; releasing funding announcements and new award notices; hosting and archiving electronic polls on research questions and priorities; hosting and archiving electronic discussion groups; and posting and answering questions about

research methods and policy issues. All registered affiliates of the ARCHES center will be able to create an account on the portal that gives viewing and posting rights.

The social value of policy research produced through the ARCHES center will only be realized if it can be used by policy stakeholders in government and the private sector to make decisions and choose actions that reduce health disparities in the region. To this end, the Administrative Core will support a tailored series of activities designed to synthesize and translate the knowledge gleaned from ARCHES studies for use by policy stakeholders. Following established and tested frameworks for knowledge translation,[81] the Core's Policy Translation Committee will design and implement the following activities:

- ***Research Synthesis Policy Briefs*** will be developed based on findings from ARCHES research and pilot projects and designed for use by policy stakeholder audiences, including state and local government officials, public health officials, health system leaders, and private sector organizations. Each written brief will synthesize findings from the ARCHES research activity with other knowledge gleaned from prior studies, and succinctly identify policy options, implications, and conclusions that flow from these findings. Clear tables, charts, and graphs will be used to efficiently summarize information, and key messages will be summarized in bullet form. Briefs will follow a length of no more than 4 pages, and provide references and links to sources of additional information. Four of these briefs will be produced in each year, starting with program Year 2. Briefs will be disseminated through the a variety of channels including ARCHES website, state and local public health agencies participating in the PBRNs, state and regional professional conferences and meetings, and the in-person ARCHES legislative and policy briefings described below.
- ***Legislative and Policy Briefings*** will be organized and delivered in each of the four Central Appalachian states each year, designed primarily for state and local government officials serving in legislative and executive branch offices. These in-person briefings will be held once per year in the state capitol city of each state, preferably corresponding with the timing of standing legislative sessions and legislative committee meetings on health issues. We will work with members of the local public health PBRN in each state to identify politically neutral organizations to co-sponsor each briefing, with preference given to the state health agency, state office of minority health, state legislative committee, local university partner(s), and similar organizations. The briefing will be designed to concisely summarize research findings on a relevant health disparity topic studied through the ARCHES center, discuss policy options and implications that flow from this research, and identify additional information needs and questions from participating legislative and policy stakeholders. Three to four speakers will be included in each briefing, representing the scientific, public health, health care system, and consumer/community perspectives. The topics and formats for each briefing will be developed collaboratively with the ARCHES policy and community stakeholders in each state. These briefings will be carefully designed as research information dissemination activities only, with no advocacy around specific policy proposals and positions. One briefing will be held in each of the 4 states during each program year 2-5.

The Core's Policy Translation Committee will carefully tailor each of the above activities to the information needs and policy perspectives identified among key stakeholders, as identified through the research needs assessment activities conducted in the Year One planning phase (described in Section I).

Access to Data: Researchers interested in the proposed project will be encouraged to contact the PI, Dr. Glen Mays, to discuss the background and status of the project, the on-going writing and presentation plans, and, overall, the data available. Dr. Schoenberg will provide the researcher with the following materials:

1. A description of the datasets available, the timeframe, and any other information that might affect data analyses or publication.

2. Our team's publication plan, a comprehensive list and description of the writing projects and presentation that the investigators intend to undertake or have undertaken. Such a publication plan will avoid overlap of topical focus.

3. The process for requesting data, described below.

Once this conversation has occurred and the researcher wishes to access the data from the proposed project, he or she must submit the following information to Dr. Cesar Mamaril, co-investigator and data manager:

1. An summary or abstract of the focus of the data analysis (i.e., topical focus, population, research questions)

2. A description of the intended analytic orientation

3. Proof of current CITI certification or other human subjects training

4. Plan for being added to the list of key personnel on the human subjects' protocol.

5. An agreement to adhere to the University of Kentucky's human subjects guidelines, including HIPAA guidelines for the use of the requested data.

Application Review, Authorization, and Dataset Distribution. Upon receipt of the database request form, Dr. Mamaril will distribute the form to the relevant co-investigators who will meet, either in person or via telephone, to discuss the request. All requests will be processed with a resulting decision within two weeks. Upon approval of the request, the researcher must work with Dr. Mays to be added to the key personnel and follow up on other human subject protection issues, as well as to sign a "database users' agreement". In this agreement, the researcher must pledge to be the sole user of the data and may not share the data without prior authorization from Dr. Mays. Additionally, upon publication or presentation of the data, the researcher will be required to acknowledge the grant award and the funding agency

Once these requirements have been fulfilled, Dr. Mamaril will:
1. Prepare a de-identified dataset by extracting the specific and requested data from the research database.
2. Compile and format the data, installing password protection or encrypting the dataset.
3. Transmit the secured dataset.
4. Send the researcher a password to access the database through a secure mechanism (e.g., telephone call).