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State Demonstrations Group

Jen Steele
Medicaid Director
State of Louisiana, Department of Health and Hospitals
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JUN 19 2019

Dear Ms. Steele:

Thank you to you and your staff for your work on the substance use disorder (SUD) evaluation design, which is a component of the state's section 1115(a), titled "Healthy Louisiana Opioid Use Disorder/Substance Use Disorder (SUD)" (Project Number 11-W-00311/6). The draft SUD evaluation design was revised and resubmitted to Centers for Medicare & Medicaid Services (CMS) on May 22, 2019, has been found to fulfill the requirements set forth in the Special Term and Conditions (STC), section XIII—and State Medicaid Director Letter SMD #17-003, "Strategies to Address the Opioid Epidemic."

The SUD evaluation design is approved for the period starting with the date of this approval letter through December 31, 2022, and is hereby incorporated into the demonstration STCs as Attachment C (see attached). Per 42 CFR 431.424(c), the approved SUD evaluation design may now be posted to your state's Medicaid website.

If you have any questions, please contact your CMS project officer, Ms. Audrey Cassidy. Ms. Cassidy is available to answer any questions concerning your section 1115(a) demonstration and her contact information is as follows:

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Official communication regarding official matters should be simultaneously sent to Ms. Cassidy and Mr. Bill Brooks, Director, Division of Medicaid Field Operations South. Mr. Brooks' contact information is as follows:

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We look forward to our continued partnership on the Healthy Louisiana SUD section 1115(a) demonstration.

Sincerely,



Angela D. Garner
Director
Division of System Reform Demonstrations

Enclosure

cc: Bill Brooks, Director, Division of Medicaid Field Operations South
Tobias Griffin, CMS State Lead, Regional Operations Group



**Tulane
University**

**SCHOOL OF PUBLIC HEALTH
AND TROPICAL MEDICINE**

Department of Health Policy and Management

**Proposed Evaluation of the State of Louisiana Substance Use Disorder
Section 1115 Demonstration**

DRAFT: May 17, 2019

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A. General Background and Information

As of 2016, Louisiana had the fifth highest per-capita rate of opioid prescriptions among U.S. states and was above the national average in drug overdose deaths (CDC, 2018). Furthermore, from 2015 to 2016, deaths in Louisiana from opioid overdose increased by 22% (KFF, 2018).

The Treatment Episode Data Set (TEDS) suggests nearly 14 thousand admissions for SUD last year.

Table 1: Substance Abuse Treatment Admissions by Primary Substance of Abuse, among admissions aged 12 and older: Louisiana 2017

Primary Substance	Number	Primary Substance	Number
Alcohol only	793	Other stimulants	17
Alcohol with secondary drug	891	Tranquilizers	140
Heroin	1,129	Sedatives	37
Other opiates	743	Hallucinogens	28
Cocaine (smoked)	649	PCP	33
Cocaine (other)	239	Inhalants	12
Marijuana	934	Other/Unknown	6,748
Amphetamines	1,510	TOTAL	13,903

<https://wwwdasis.samhsa.gov/webt/quicklink/LA17.htm>

The National Survey of Substance Abuse Treatment Services (N-SSATS) is an annual survey of facilities providing substance abuse treatment. In Louisiana, 157 substance abuse treatment facilities were included in the 2016 N-SSATS, which reported a total of 9,628 clients in substance abuse treatment on March 31, 2016.

(<http://www.samhsa.gov/data/2k3/NSSATS/NSSATS.pdf>).

Treatment options for patient with SUD include one or more of the following service components:

- Individual and group counseling
- Inpatient and residential treatment
- Intensive outpatient treatment
- Partial hospital programs
- Case or care management
- Medication
- Recovery support services
- 12-Step fellowship
- Peer supports

Source: <https://www.samhsa.gov/treatment/substance-use-disorders>

Among the treatment options are Institutions for Mental Diseases (IMD). However, from its inception in 1965, Medicaid has excluded IMD coverage for those between the ages of 21 and 64 (Section 1905(a)(B) of the Social Security Act). The IMD exclusion was intended to focus treatment of mental diseases at non-residential settings and leave states with the responsibility for funding inpatient psychiatric services (https://lac.org/wp-content/uploads/2014/07/IMD_exclusion_fact_sheet.pdf).

Since 2012, Louisiana has been able to include coverage of IMD provided services under the Louisiana Behavioral Health Partnership (LBHP) and, later, Healthy Louisiana, since coverage was determined to be “cost-effective” and capitated by the Louisiana Department of Health (LDH). In 2016, the Center for Medicare and Medicaid Services (CMS) revised regulations and changed capitation policies prohibiting coverage (Federal participation in coverage) for IMD stays beyond 15 days per month.

In response to the growing concern over rates of opioid use disorders (OUDs) and substance use disorders (SUDs) in general, the Louisiana Department of Health applied for a Section 1115(a) Demonstration in 2017 to allow for the continuation of treatment for OUD/SUD in institutions for mental diseases (IMDs) regardless of the length of stay.^{1,2} In addition, the waiver included several other proposed interventions aimed at improving outcomes for those with an OUD/SUD in areas such as access to critical levels of care for OUD/SUD, the use of evidence-based SUD patient placement criteria, access to medication-assisted treatment (MAT), and care coordination and transition between levels of OUD/SUD care. The Healthy Louisiana Substance Use Disorder 1115 Demonstration was approved by CMS on February 1, 2018 and will continue through December 31, 2022. The scope of the demonstration requires no change in Medicaid eligibility, therefore the affected population will be Medicaid beneficiaries in the state of Louisiana who are treated for an OUD/SUD.

The purpose of the demonstration is to maintain critical access to OUD/SUD services and continue delivery system improvements to provide more coordinated and comprehensive treatment for Medicaid beneficiaries. The demonstration aims to achieve the following goals:

- a. Increase access to evidence-based OUD/SUD care
- b. Increase access to and utilization of medication-assisted treatment (MAT) for OUD/SUD
- c. Ensure sufficient provider capacity at each level of care for OUD/SUD
- d. Decrease use of medically inappropriate care and reduced reliance on emergency department and hospital services for OUD/SUD treatment
- e. Reduce readmission rates for OUD/SUD treatment
- f. Increase use of evidence-based OUD/SUD patient placement criteria
- g. Increase initiation of follow-up after discharge from the emergency department or hospital for OUD/SUD

¹ Section 1905 42 of U.S.C. 1396d defines IMDs as “a hospital, nursing facility, or other institution of more than 16 beds, that is primarily engaged in providing diagnosis, treatment, or care of persons with mental diseases, including medical attention, nursing care, and related services.”

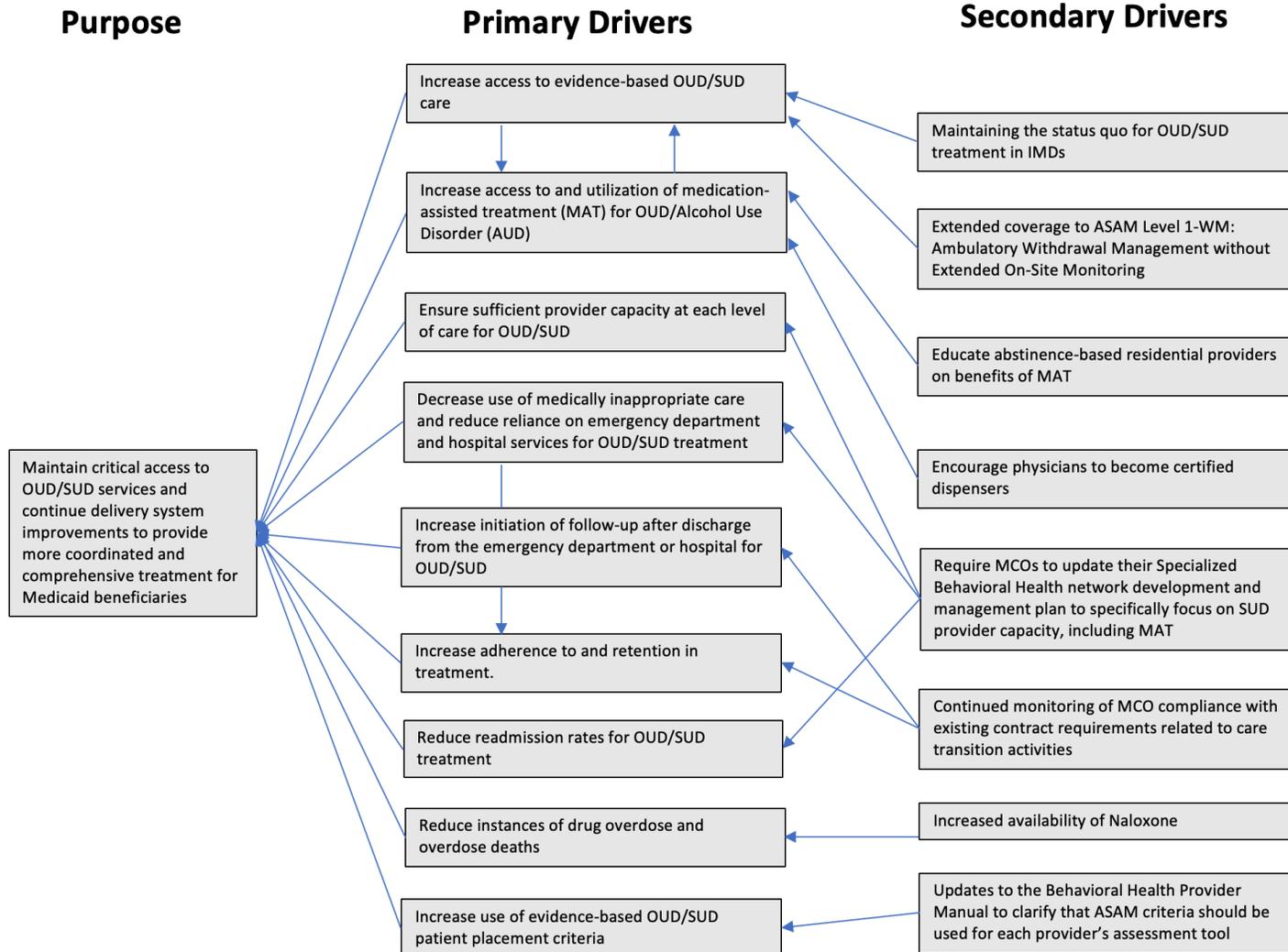
² While IMDs have been excluded from federal financial participation since Medicaid’s inception, several states have used an “in lieu of” policy to fund IMD care using federal dollars through capitated payments to managed care organizations (Musumeci, 2018). In May 2016, CMS implemented a policy to limit “in lieu of” payments to IMD stays to 15 days in a calendar month (Priest et al., 2017)

- h. Increase adherence to and retention in treatment
- i. Reduce instances of drug overdose and overdose deaths

The demonstration implementation plan includes five separate milestones that address various areas of OUD/SUD treatment including access, placement, standards of care, and provider capacity. We develop hypotheses surrounding these milestones and their potential impact on the demonstration goals and describe our proposed methodology for testing these hypotheses below.

B. Evaluation Questions and Hypotheses

B.1 Driver Diagram & Model Assumptions



Model Assumptions:

1. Medicaid beneficiaries cannot afford treatment.
2. Providers will read the Louisiana Medicaid Provider manual.
3. Abstinence-only providers will read or participate in education.
4. Cost is a major barrier to evidence-based treatment for providers.
5. Knowledge is a major barrier preventing providers from engaging in evidence-based treatment.
6. Providers will comply with the requirement.
7. MCOs' contract requirements related to linkages to care are appropriate.
8. There is a process in place by which tracking data for opioids and Naloxone is acted upon.
9. Community-based services are effective.

B.2 Questions and Hypotheses

Table 2: Evaluation Questions, Demonstration Goals, and Evaluation Hypotheses

Evaluation Question 1: Did access to evidence-based OUD/SUD care increase as a result of the demonstration?						
Demonstration Goal 1.1: Increase access to evidence-based OUD/SUD care.						
Evaluation Hypothesis: The demonstration will increase the share of beneficiaries who are treated for OUD/SUD in ways that are consistent with evidence-based care.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Increase access to evidence-based OUD/SUD care)	Share of beneficiaries with an OUD/SUD treated in an IMD	CMS	Extensive Margin: Number of unduplicated beneficiaries enrolled in a reporting month (year) with a claim that uses an SUD diagnosis code as the primary diagnosis from an IMD billing provider	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis	Louisiana Medicaid Claims Data	DD using IMD patients with no OUD/SUD as controls
	Average LOS for beneficiaries with an OUD/SUD treated in an IMD		Intensive Margin: Average LOS for beneficiaries treated in an IMD	Condition on unduplicated beneficiaries enrolled in a reporting month (year) with a claim that uses an SUD diagnosis code as the primary diagnosis from an IMD billing provider		
Secondary Drivers (Maintaining the status quo for OUD/SUD treatment in IMDs; Extended coverage to ASAM Level 1-WM: Ambulatory Withdrawal Management without Extended On-Site Monitoring)	Share of beneficiaries with an OUD/SUD receiving ASAM care at various levels.	ASAM	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted ASAM claim at each ASAM level	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis	Louisiana Medicaid Claims Data	Pre/Post

Demonstration Goal 1.2: Increase access to and utilization of medication-assisted treatment (MAT) for OUD/Alcohol Use Disorder (AUD). Evaluation Hypothesis: The demonstration will increase the use of MAT.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Increase access to and utilization of medication-assisted treatment (MAT) for OUD/Alcohol Use Disorder (AUD))	Share of those with an OUD/AUD diagnoses who are treated using MAT	N/A	Number of unduplicated Medicaid beneficiaries enrolled in a reporting month (year) with a claim that uses an OUD/AUD diagnoses code as the primary diagnosis for Buprenorphine, Suboxone, Bunavail, Zubsolv, Probuphine, Naltrexone, Vivitrol, Disulfiram, or Acamprosate.	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an OUD/AUD diagnosis code as the primary diagnosis	Louisiana Medicaid Claims data	ITS & DD using pre-demonstration exposure to MAT
					Key informant interviews with residential providers	Thematic analysis of qualitative data
Secondary Drivers (Educate abstinence-based residential providers on benefits of MAT; Encourage physicians to become certified dispensers)	Number of providers who are certified to prescribe or dispense buprenorphine per 100,000 state residents.	SAMHSA	Number of waived physicians	State population divided by 100,000.	SAMHSA Buprenorphine Treatment Practitioner Locator; Number of DATA-Certified Physicians	DD comparing LA to other states
			Number of waived physicians with paid/accepted MAT prescription claims that use an SUD diagnosis code as the primary diagnosis for more than 2 unduplicated beneficiaries in a reporting month (year)	N/A	SAMHSA and Louisiana Medicaid Claims data	Pre/Post
					Key informant interviews with physicians	Thematic analysis of qualitative data

Demonstration Goal 1.3: Ensure sufficient provider capacity at each level of care for OUD/SUD. Evaluation Hypothesis: The demonstration will improve provider capacity.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Ensure sufficient provider capacity at each level of care for OUD/SUD)	Total number of SUD providers	N/A	Number of Unduplicated NPI provider records with active enrollment for SUD services during reporting year	N/A	Louisiana Medicaid Claims data	ITS
Secondary Driver (Require MCOs to update their Specialized Behavioral Health network development and management plan to specifically focus on SUD provider capacity, including MAT)	SUD providers per SUD beneficiary	N/A		Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis		
	SUD providers per SUD beneficiary by ASAM level of care	ASAM	Number of Unduplicated NPI provider records with active enrollment for SUD services during reporting year by ASAM level of care	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis		

Evaluation Question 2: Did use of medically-inappropriate care including emergency department and hospital care for OUD/SUD decline as a result of the demonstration?						
Demonstration Goal 2.1: Decrease use of medically inappropriate care and reduce reliance on emergency department and hospital services for OUD/SUD treatment.						
Evaluation Hypothesis: The demonstration will reduce visits to the emergency department and the use of hospital services for the treatment of OUD/SUD.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Decrease use of medically inappropriate care and reduce reliance on emergency department and hospital services for OUD/SUD treatment)	Emergency department visits for OUD/SUD	N/A	Number of unduplicated beneficiaries enrolled in a reporting month (year) with a claim that uses an SUD diagnosis code as the primary diagnosis with HCPCS/Procedure Codes 99281, 99282, 99283, 99284, 99285 or place of service 23 (ER-Hospital)	N/A	Louisiana Medicaid Claims data	ITS & DD using non-targeted conditions for those with no OUD/SUD
Secondary Driver (Require MCOs to update their Specialized Behavioral Health network development and management plan to specifically focus on SUD provider capacity, including MAT)	Inpatient admissions for OUD/SUD		Number of unduplicated beneficiaries enrolled in a reporting month (year) with admit date for inpatient services billed from a Mental Health Free-Standing Hospital or from a Distinct Part Psych Hospital that uses an SUD diagnosis code as the primary diagnosis, or for inpatient services billed from a General Acute Care Hospital that uses an SUD diagnosis code as the primary diagnosis along with a visit from an LMHP during inpatient stay		Key informant interviews with primary care/treatment providers and ED managers	Thematic analysis of qualitative data

Demonstration Goal 2.2: Reduce readmission rates for OUD/SUD treatment. Evaluation Hypothesis: The demonstration will reduce hospital readmission rates for OUD/SUD.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Reduce readmission rates for OUD/SUD treatment)	Readmissions for OUD/SUD	ASAM	Number of paid/accepted (ASAM 4-WM) claims in a reporting month (year) for inpatient withdrawal management services billed from a Mental Health Free-Standing Hospital or from a Distinct Part Psych Hospital that uses an SUD diagnosis code as the primary diagnosis, or for inpatient withdrawal management services billed from a General Acute Care Hospital that uses an SUD diagnosis code as the primary diagnosis along with a visit from an LMHP during inpatient stay, that follows within 30 days of a previous discharge from an ASAM 4-WM inpatient stay	N/A	Louisiana Medicaid Claims data	ITS & DD using non-targeted conditions for those with no OUD/SUD
Secondary Driver (Require MCOs to update their Specialized Behavioral Health network development and management plan to specifically focus on SUD provider capacity, including MAT)						

Demonstration Goal 2.3: Increase use of evidence-based OUD/SUD patient placement criteria. Evaluation Hypothesis: The demonstration will increase the use of evidence-based OUD/SUD patient placement criteria.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Increase use of evidence-based OUD/SUD patient placement criteria)	Appropriate patient placement for OUD/SUD treatment	LDH	Number of unduplicated Medicaid beneficiaries in a reporting month (year) with a paid/accepted claim that uses an SUD diagnoses code as the primary diagnosis receiving medically appropriate placement	Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis	MCO Monitoring Reports	ITS
Secondary Driver (Updates to the Behavioral Health Provider Manual to clarify that ASAM criteria should be used for each provider's assessment tool)						

Evaluation Question 3: Did care-coordination improve as a result of the demonstration?						
Demonstration Goal 3.1: Increase initiation of follow-up after discharge from the emergency department or hospital for OUD/SUD.						
Evaluation Hypothesis: The demonstration will increase initiation of follow-up after discharge from the emergency department or hospital for OUD/SUD.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Increase initiation of follow-up after discharge from the emergency department or hospital for OUD/SUD)	Follow-up after discharge from the ED for OUD/SUD	NCQA	Number of ED visits for OUD/SUD for which the beneficiary received follow-up within (a) 7 days of discharge or (b) 30 days of discharge	Total number of ED visits for OUD/SUD	Louisiana Medicaid Claims data	ITS
Secondary Driver (Continued monitoring of MCO compliance with existing contract requirements related to care transition activities)	Follow-up after discharge from the hospital for OUD/SUD		Number of hospital inpatient admissions for OUD/SUD for which the beneficiary received follow-up within (a) 7 days of discharge or (b) 30 days of discharge	Total number of hospital inpatient admissions for OUD/SUD	Survey of SUD treatment facilities pre- and post-intervention	Descriptive statistics; chi square tests of significance comparing values before and after the intervention

Demonstration Goal 3.2: Increase adherence to and retention in treatment. Evaluation Hypothesis: The demonstration will increase adherence to and retention in treatment.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Increase adherence to and retention in treatment)	Share of those with an OUD/SUD diagnosis who receive follow-up treatment within 35-60 and 61-90 days after initial episode of care	LDH	Number of unduplicated Medicaid beneficiaries in a reporting month (year) with a paid/accepted claim that uses an SUD diagnoses code as the primary diagnosis who have no prior SUD service claim in the previous 90 days and who have at least one SUD service claim between days 35-60 and days 61-90 following initiation of treatment	Number of unduplicated Medicaid beneficiaries in a reporting month (year) with a paid/accepted claim that uses an SUD diagnoses code as the primary diagnosis who have no prior SUD service claim in the previous 90 days	Louisiana Medicaid claims data	Pre/Post
Secondary Driver (Continued monitoring of MCO compliance with existing contract requirements related to care transition activities)						

Evaluation Question 4: Did health outcomes for Medicaid beneficiaries with OUD/SUD improve as a result of the demonstration?						
Demonstration Goal 4.1: Reduce instances of drug overdose and overdose deaths.						
Evaluation Hypothesis: The demonstration will decrease the rate of drug overdose and the number of drug deaths.						
Driver	Measure Description	Steward	Numerator	Denominator	Data Source	Analytic Approach
Primary Driver (Reduce instances of drug overdose and overdose deaths)	Number of non-fatal drug overdoses	N/A	Number of unduplicated Medicaid beneficiaries enrolled in a reporting month (year) with a non-fatal occurrence of drug overdose. Non-fatal overdoses will be tracked using ICD-10 poisoning codes of all intents for medication/drugs/substances commonly abused and cross-referenced with death record data to exclude fatal overdoses.	N/A	Louisiana Medicaid Claims data and Louisiana Office of Public Health Vital Records	ITS
	Share of those with an OUD/SUD diagnosis who experience a non-fatal overdose			Number of unduplicated Medicaid beneficiaries enrolled in reporting month (year) with a paid/accepted claim for date of service in reporting month (year) that uses an SUD diagnosis code as the primary diagnosis		
Secondary Driver (Increased availability of Naloxone)	Number of overdose deaths	CDC LDH OBH	Total number of deaths in Louisiana attributed to accidental poisoning by and exposure to drugs and other biological substances	N/A	National Vital Statistics System Mortality Multiple Cause-of-Death Restricted Use Files Louisiana Medicaid Claims data and data from the Advisory Council on Heroin and Opioid Prevention and Education (HOPE council)	DD
	Share of all deaths related to overdose			Total number of deaths in Louisiana	Key informant interviews with primary care/treatment providers and local health officials	

B.3 Required Evaluation Topic: Demonstrate patterns and trends in Medicaid costs associated with SUD 1115 demonstration

Methodology for analyzing costs of the Louisiana SUD waiver to the Medicaid program

Identify Medicaid beneficiaries with a SUD. Using files obtained from Louisiana Medicaid data warehouse, including inpatient, outpatient, pharmacy, and long-term care claims, we will identify beneficiaries with a substance use diagnosis or treatment code during the pre- and post-demonstration periods. We will link beneficiaries with a SUD diagnosis or treatment during the specified time periods to Medicaid eligibility data and demographic characteristics, to identify the months a beneficiary was enrolled in Medicaid. The analysis will include the first month where a SUD diagnosis or treatment claim was observed for the beneficiary and for up to eleven additional months that did not include claims for SUD diagnosis or treatment if the beneficiary remained enrolled in Medicaid. Repeated SUD diagnoses or treatment claims will extend the observation period included in the analysis.

Organize the data to create a file with an observation for each month a beneficiary is Medicaid-eligible, on or after their first observed SUD-related claim during the analysis period. For each month that an individual is enrolled, the data file will contain an observation with their Medicaid costs in that month, using the ten variables specified in Table 1 and demographic characteristics merged from the eligibility data.

Develop shadow cost prices. As Louisiana Medicaid patients are in managed care we will use the published fee-for-service schedule for Louisiana's Medicaid program. This list maps Current Procedural Terminology (CPT) codes and provider types onto dollar costs. Additionally, there are Healthcare Common Procedure Coding System (HCPCS) codes that define daily charges for SUD IMD stays and these rates are specific to SUD patients.

Waiver administrative costs. The costs for administering Louisiana's SUD 1115 waiver program are entirely staffing costs. There are 10 staff members involved in administering the waiver program. We will ask each staff member to estimate the percentage of their effort spent on administering the SUD waiver, percentage of time spent supporting the waiver evaluation efforts, and percentage of time spent on other duties. We will multiply the percentage efforts spent directly on administering the waiver by salaries to obtain administrative costs for the waiver program.

Calculate and trend average monthly spending. From the individual month-level data, we will calculate average costs, across the categories presented in Table 3, separated into months before the demonstration and months after. These means will be plotted to show trends visually and to verify that month-to-month variation is within expectations and does not indicate an underlying data error. Depending on variance in costs we may collapse data to the quarterly level to smoothly out monthly variation in costs.

Table 3: Types of costs and data sources

Level of analysis	Type of costs	Data source
Total costs	Total costs	Louisiana Medicaid Claims Data, IMD costs, administrative costs
	Total federal costs	Total Medicaid costs * federal medical assistance percentage [FMAP] for the state
SUD cost drivers*	SUD-IMD	IMD costs reported by Louisiana Medicaid Claims Data
	SUD-other	Louisiana Medicaid Claims Data
	Non-SUD	Louisiana Medicaid Claims Data
Type or source of care cost drivers*	Outpatient costs – non ED	Louisiana Medicaid Claims Data
	Outpatient costs – ED	
	Inpatient costs	
	Pharmacy costs	
	Long-term care costs	

Our model for identifying the impact of the SUD 1114 waiver program on costs will be an interrupted time-series design without a comparison group. This is necessary as there is no geographic or eligibility variation in the Louisiana Medicaid population in who is eligible for these services. For our interrupted time series regression analysis of costs, we will include an indicator equal to 1 for months on or after the start date of the demonstration and equal to 0 for the pre-demonstration period months. Our regression model will also include covariates to control for age, race, gender, and dual eligibility status. We will model costs in a two-part model where the first part is a logit model where the outcome is whether there are any costs in the person-month and in the second part the outcome is log costs as costs are typically not normally distributed.

For each outcome in Table 3 we will run the following model:

$$\text{Costs} = \beta_0 + \beta_1 * \text{TIME} + \beta_2 * \text{POST} + \beta_3 * (\text{TIME} * \text{POST}) + B_i * \text{CONTROLS} + \varepsilon$$

Where:

TIME is a count variable that starts with the first quarter pre-demonstration period data and ends with the last quarter of post-demonstration period data.

POST is the indicator variable that equals 1 if the month occurred on or after demonstration start date.

CONTROLS are covariates, such as age, gender, race, dual Medicare-Medicaid enrollment, and month.

We will report marginal effects and standard errors to assess statistically significant changes in costs. Changes in average costs after the intervention will be captured by β_2 . If this is positive and statistically significant it will indicate costs are higher in the post-demonstration period. Changes in trends in costs will be captured by β_3 . If this is positive and statistically significant it will indicate cost trends have increased in the post period. Together these two coefficients will capture potential program impacts on cost. We will also report regression adjusted means (either monthly or quarterly), as described previously, to make regression results more easily interpretable for lay audiences.

C. Methodology

C.1 Evaluation Methodology

We will use three methods to evaluate the hypotheses listed in Table 2. When it is possible to designate a control group, our preferred methodology will be a differences-in-differences (DD) design. DD is a quasi-experimental research technique that compares changes over time for a group that is impacted by an intervention (treatment group) to a group that is unaffected by the intervention (control group). The inclusion of a control group enhances the rigor of the research design and reduces the concern over potential confounders as estimates from the DD model are unaffected by changes common to both the treatment and control groups. We discuss the specifics of the DD models we plan to implement in our evaluation in Section C.5 below and describe limitations of the DD method in Section D.

Use of the DD methodology will not be possible when we are unable to identify an appropriate control group who would be plausibly unaffected by a particular intervention. Instead, we will rely on one of two alternative research designs: interrupted time series analysis or a pre/post analysis. The interrupted-time series (ITS) method examines changes over time in an outcome for a treatment group. The evaluation period spans the periods before and after the intervention so as to capture changes that correspond to the timing of the intervention. An ITS analysis does not require a control group, but instead compares changes within the treatment group over time. As an example, suppose we track rates of ED admissions for OUD/SUD in Louisiana in the periods before and after enactment of the milestones described in the state's implementation plan. The ITS works by statistically modeling the trend over time in OUD/SUD ED use and determines whether the level or slope of the trend changes at a point in time that corresponds to the intervention. The level change identifies any immediate effect of the intervention, while the change in slope (or trend) will capture changes over time.

Finally, for a small number of outcomes, both the DD and ITS will be infeasible. This will occur when we are unable to identify an appropriate control group and when time-series data on a particular outcome is limited. For example, since ASAM Level 1-WM treatment was not a covered benefit prior to the demonstration, we cannot model the trend in this treatment over time for Medicaid beneficiaries. In these cases, we will use a simple pre/post analysis to statistically compare changes in outcomes from the pre-intervention period to the post-intervention period.

C.2 Target and Comparison Populations

For most analyses, the target population will consist of the Medicaid population with an OUD/SUD. The inclusion criterion for this group is Medicaid beneficiaries enrolled in a specific reporting period (e.g., month or year) with a paid/accepted claim that uses an OUD/SUD diagnosis code as the primary diagnosis.

When examining changes in physician certified dispensers, the target population will include all waived physicians in the state of Louisiana listed in the SAMHSA Buprenorphine Treatment Practitioner Locator and the DATA-Certified Physician Totals. In some specifications, we will compare changes in the number of waived physicians in Louisiana to changes in other states.

In those instances, our population will expand to include physicians from non-SUD demonstration states. In addition, we will use NPI provider records from the Medicaid claims data to measure active physician treatment for SUD services.

Finally, when examining overdose deaths, our target population will be comprised of those whose cause of death is listed as an “accidental poisoning by and exposure to drugs and other biological substances” in both Louisiana and other control states.

C.3 Evaluation Period

The evaluation period for analyses using the Medicaid claims data will begin in January 2014 and will be ongoing through the projected end of the demonstration in December 2022. Though the demonstration was approved in February 2018, we will incorporate data from the 2014 through 2017 in order to establish trends and use-rates in the pre-demonstration period. We will then measure changes in these outcomes from the pre-demonstration to post-demonstration periods.

C.4 Data Sources

The primary data source for our analysis is the Louisiana Medicaid claims database. We have obtained this data through an agreement with the Louisiana Department of Health. Additional data sources include the Buprenorphine Treatment Practitioner Locator and DATA-Certified Physicians Totals collected by SAMHSA and the National Vital Statistics System Mortality Multiple Cause-of-Death Restricted Use Files. The Buprenorphine Treatment Practitioner Locator and DATA-Certified Physicians data are freely available through SAMHSA’s website. We will apply for access to restricted-use versions of the Mortality Multiple Cause-of-Death files, which is necessary in order to obtain geographic identifiers.

The quality of the Medicaid claims data is quite high and the data have few limitations for our purposes. We have access to the universe of Medicaid claims data, including prescription drug files, so that we are able to construct a nearly complete picture of beneficiary care for OUD/SUD. Limitations of these data would include coding inconsistencies across MCOs in Louisiana and our inability to observe any patient care obtained that is not financed through the Medicaid system. However, these limitations are not expected to be significant causes of concern for our evaluation as coding for OUD/SUD treatment is standardized and relatively few Medicaid beneficiaries are expected to receive care for which a claim was not processed through the Medicaid program.

Similarly, the quality of the Mortality Multiple Cause-of-Death files is generally seen to be high as the data are derived from individual death certificates and are a near census of all deaths in U.S. According to the National Vital Statistics System, the Mortality Multiple Cause-of-Death files are a “fundamental” source of information on cause of death. A potential limitation of these data is underreporting of opioid overdose as a cause of death. For example, Buchanich et al. (2018) suggests that as many as 70,000 opioid overdose deaths from 1999 to 2015 were misclassified as “unspecified overdose deaths”. To address this limitation, we plan to analyze both opioid-related overdose deaths and all deaths due to overdose.

SAMHSA maintains two sources of data on physician certification for treating OUD/SUD through MAT: The Buprenorphine Treatment Practitioner Locator and DATA-Certified Physicians database. Data elements on DATA-Certified Physicians is collected from online submission forms that physicians must complete in order to attain waiver certification. The Buprenorphine Treatment Practitioner Locator data is taken from practitioner profiles maintained by SAMHSA. In both cases, the quality of the data depend on the accuracy of the information provided by physicians. Inaccuracies are likely to be minimal for data on the counts of waived physicians, while information on physician location (including practice address) will be more susceptible to error. We can use the Medicaid Claims Provider files to improve our understanding of physician location.

We have obtained Louisiana Medicaid claims data from January 2014 through February 2018 and will continue to receive updated claims at 6-month intervals. The Mortality Multiple Cause-of-Death files are made available with a 1-year lag (i.e., data for the year 2017 will be made available in December 2018). We will apply for the Mortality Multiple Cause-of-Death files through 2018 and continue to apply for updated data each year as new files are made available. The SAMHSA data is updated annually with some delay.

C.5 Analytic Methods

Quantitative Methods

Our preferred methodology for evaluating the hypotheses listed above is a quasi-experimental research design known as difference-in-differences (DD). The term quasi-experimental refers to approaches like DD that attempt to mimic a randomized controlled trial by assigning individuals to a treatment group or a control group and then measuring changes between the two groups over time. The treatment group is defined by exposure to an intervention, while the control group should ideally be similar to the treatment group but remain unexposed. Under standard assumptions for the DD methodology (listed in section D), changes in outcomes for the treatment group relative to the control group can be interpreted as causal impacts of the intervention.

The DD model can be formally represented as follows:

$$Outcome_{ist} = \beta_0 + \beta_1 Treat_{is} + \beta_2 Post_t + \beta_3 Treat_{is} \times Post_t + \beta_4 X_{ist} + \beta_5 Z_{st} + \delta_s + \tau_t + \varepsilon_{ist}$$

Where $Outcome_{ist}$ represents the outcome of interest to be estimated for individual i living in state/region s at time t . $Treat$ is an indicator for assignment to the treatment group and $Post$ an indicator for the post-intervention period. The interaction term, $Treat_{is} \times Post_t$, is the coefficient of interest and represents the effect of the intervention on the treatment group relative to the control group. Finally, X is a vector of individual characteristics such as age and sex, Z is a vector of state or region characteristics such as unemployment rates, δ and τ are state/region and time fixed effects, and ε is an error term that captures unobserved factors associated with the outcome of interest. Most of the DD models will be estimated using ordinary least squares (OLS), however we may employ nonlinear estimation techniques to account for relatively rare

outcomes. Table 2 below lists each outcome that we plan to analyze using the DD technique and the populations assigned to the treatment and control groups.

Table 4: Outcomes and Treatment/Control Designations for DD Models

Outcome	Treatment Group	Control Group
Share of beneficiaries with an OUD/SUD treated in an IMD	OUD/SUD beneficiaries	Non-OUD/SUD beneficiaries treated at IMDs
Average LOS for beneficiaries with an OUD/SUD treated in an IMD	OUD/SUD beneficiaries	Non-OUD/SUD beneficiaries treated at IMDs
Share of those with an OUD/SUD diagnoses who are treated using MAT	OUD/SUD beneficiaries in regions with low pre-demonstration MAT use	OUD/SUD beneficiaries in regions with high pre-demonstration MAT use
Number of providers who are certified to prescribe or dispense buprenorphine per capita.	Per capita certified dispensers in Louisiana	Per capita certified dispensers in control states
Emergency department visits for OUD/SUD	OUD/SUD beneficiaries	Non-OUD/SUD beneficiaries
Inpatient admissions for OUD/SUD	OUD/SUD beneficiaries	Non-OUD/SUD beneficiaries
Readmissions for OUD/SUD	OUD/SUD beneficiaries	Non-OUD/SUD beneficiaries
Number of overdose deaths	Louisiana decedents	Decedents in control states
Share of all deaths related to overdose	Louisiana decedents	Decedents in control states

The inclusion criteria for each of our proposed control groups is as follows:

1. Non-OUD/SUD beneficiaries treated at IMDs: includes Medicaid beneficiaries treated at IMDs who do not have a diagnosis of OUD/SUD and are therefore subject to the IMD exclusion rule. We plan to use a propensity score matching technique to generate a control group of non-OUD/SUD IMD patients with characteristics similar to those with an OUD/SUD diagnosis.
2. OUD/SUD beneficiaries in regions with high pre-demonstration MAT use: MAT use for OUD/SUD varies geographically across the state of Louisiana. For example, Orleans Parish has 182 certified MAT prescribers, while 40 parishes have fewer than 5 MAT prescribers and 9 parishes have 0 prescribers.³ We propose to create a control group composed of Medicaid OUD/SUD beneficiaries in regions with high pre-demonstration MAT use, as these individuals would be relatively less impacted by the demonstration’s efforts to increase MAT use. Geographic regions would likely be delineated at the zip code or parish level depending on the sample size and high/low MAT use will be defined based on quartile of per-capita MAT claims.
3. Certified dispensers in control states: control states will include those states that have expanded Medicaid coverage under the ACA, but have not received approval for an SUD Section 1115 Demonstration Waiver. Additionally, we will confirm whether pre-

³ See the Louisiana Section 1115 Demonstration Waiver Implementation Plan for a complete count of MAT prescribers by parish.

demonstration trends in outcomes for Louisiana and the control states are similar and may alter the combination of control states based on these trends.

4. Non-ODU/SUD beneficiaries: includes Medicaid beneficiaries without an OUD/SUD diagnosis. We plan to use a propensity score matching technique to generate a control group of non-ODU/SUD beneficiaries with characteristics similar to those with an OUD/SUD diagnosis. We will also compare average resource utilization by diagnosis to eliminate beneficiaries from the control group who visit the ED or are admitted to the hospital with conditions that tend to result in much higher or much lower utilization compared to OUD/SUD treatments.
5. Decedents in control states: control states will include those states that have expanded Medicaid coverage under the ACA, but have not received approval for an SUD Section 1115 Demonstration Waiver. Additionally, we will confirm whether pre-demonstration trends in outcomes for Louisiana and the control states are similar and may alter the combination of control states based on these trends.

For cases where no appropriate control group can be defined, we will instead rely on either an interrupted time series analysis or a simple pre/post analysis. The interrupted time series model can be described as follows:

$$Outcome_{it} = \beta_0 + \beta_1 Time_t + \beta_2 Implement_t + \beta_3 Time_t \times Implement_t + \beta_4 X_{ist} + \beta_5 Z_{st} + \delta_s + \varepsilon_{ist}$$

Where *Time* is a continuous measure of time denoted in either year, year-quarter, or month depending on sample sizes. *Implement* is an indicator for the implementation of a demonstration milestone meant to impact the outcome in question and measures any break in trend associated with the intervention. The interaction term, $Time_t \times Implement_t$ captures any change in to the slope of the trend that occurred after the intervention. All other variables remain as previously defined.

Finally, in a small number of cases, neither a DD or ITS will be feasible due to a lack of control group and time-series data. In these cases, we will use a simple pre/post comparison of mean changes and test for statistical significance between the pre- and post-period using t-tests or chi-square tests depending on the outcome to be analyzed.

Qualitative methods

1. Evaluation methodology

The evaluation will use qualitative methods to examine the reasons why the expected impacts were or were not observed. Qualitative data collection will be informed by findings from a preliminary analysis of quantitative indicators listed in the summary table which will be conducted after the first 12 months of the intervention. The methodology used to assess each research question is as follows:

a. Does the demonstration increase access to and utilization of SUD treatment centers?

In-depth interviews will be conducted with inpatient and outpatient treatment providers who began offering evidence-based treatment/MAT after the start of the intervention, and those who did not. The interviews will discuss whether the SUD 1115 waiver impacted the decision to begin offering treatment, and the barriers the offering evidence-based treatment that remain.

b. Did use of medically-inappropriate care including emergency department and hospital care for OUD/SUD decline as a result of the demonstration?

Key informant interviews with primary care/treatment providers and ED managers will be conducted. If preliminary data shows that inappropriate care has declined, the interviews will explore the mechanisms by which the SUD 1115 waiver had an impact. If inappropriate care has not declined, interviews will explore the reasons why the SUD 1115 waiver has not had an impact and the barriers to reducing inappropriate care.

c. Did care-coordination improve as a result of the demonstration?

A survey will be administered to treatment facilities after the first year of the demonstration (February/March 2019) and repeated annually over the course of the demonstration. The survey will assess the changes in capacity for care coordination of each facility before and after the intervention.

d. Did health outcomes for Medicaid beneficiaries with OUD/SUD improve as a result of the demonstration?

Key informant interviews with primary care/treatment providers and local health officials will be conducted. If preliminary data shows that health outcomes are improving, the discussions will focus on the mechanisms by which the SUD 1115 waiver had an impact. If not, the discussions will center on the reasons why this expected impact has not been observed.

e. Target and comparison populations.

The types and numbers of respondents, as well as the selection methodology, is detailed in the table below. In most cases, two respondents will be selected from each of Louisiana's nine LDH regions, to ensure regional representation.

Table 5: Types and numbers of respondents and selection methodology.

Research question	Type of respondent	Number	Selection methodology
Does the demonstration increase access to and utilization of SUD treatment centers?	Inpatient treatment providers who started offering MAT after Feb 2018	18	Selected randomly within health regions from Medicaid claims data cross-referenced with SAMHSA survey data
	Inpatient treatment providers who continue not to offer MAT after Feb 2018	18	Selected randomly within health regions from Medicaid claims data cross-referenced with SAMHSA survey data
	Outpatient providers who received certification to offer MAT after Feb 2018	18	Selected randomly within health regions from Medicaid claims data cross-referenced with SAMHSA survey data
	Outpatient providers who continue not to have certification to offer MAT after Feb 2018	18	Selected randomly within health regions from Medicaid claims data cross-referenced with SAMHSA survey data
Did use of medically-inappropriate care including emergency department and hospital care for OUD/SUD decline as a result of the demonstration?	Primary care/ treatment providers who care for SUD patients	18	Selected randomly within health regions from Medicaid claims data
	Emergency department managers	18	Selected randomly within health regions from roster of hospitals with ED's
Did care-coordination improve as a result of the demonstration?	SUD treatment facilities	All existing	All Louisiana facilities listed on SAMHSA roster
Did health outcomes for Medicaid beneficiaries with OUD/SUD improve as a result of the demonstration?	Primary care/ treatment providers who care for SUD patients	18	Selected randomly within health regions from Medicaid claims data
	Parish and city health officials	18	Health departments selected randomly within health regions from NACCHO roster; respondents identified as point people for SUD programming

f. Evaluation period

Qualitative data will be collected during Year 3 of the intervention.

g. Data sources

Data will be collected through in-depth and key informant interviews with stakeholders within the health system. Interviews will be audio recorded with the respondent's permission. If no permission is given, the interviewer and a research assistant will take detailed notes. Audio recordings will be transcribed.

h. Analytic methods

Two members of the research staff will code a subset of the data, then develop a common set of codes. Each research staff member will code the full data set and inter-rater reliability will be calculated. Major discrepancies in coding will be resolved between the research staff members.

Data will be coded for themes based on the research questions and triangulated with findings from the quantitative analysis. The analysis will describe areas of consensus among respondents, as well as areas in which there were differing viewpoints. Findings will be presented with illustrative quotations.

D. Methodological Limitations

D.1 Quantitative Limitations

There are two important limitations of the DD design that we propose to use throughout this evaluation. The first limitation involves simultaneous changes in OUD/SUD policy that overlap with the waiver demonstration. For example, if the state or local municipalities enact policies aimed at curbing opioid overdose that are concurrent with the implementation of the demonstration measures, then it would be difficult to untangle the relative impact of the two interventions on overdose rates. This is a valid concern as several opioid-related policies have taken effect throughout Louisiana recently. In instances where these policies vary geographically, we can leverage this variation to separate demonstration impacts from alternate policy impacts. However, concurrent policy adoption remains a limitation of the DD methodology.

Another necessary assumption for the validity of the DD design is that outcomes for the treatment and control groups would have continued to trend in a similar fashion in the absence of changes associated with the demonstration. This assumption is untestable, as it is impossible to observe the treatment group in the untreated state during the post-treatment period; however, evidence that these two groups followed similar trends in the outcome variable in the pre-demonstration period lends credence to the DD estimation strategy. We will examine evidence of parallel pre-period trends before implementing our DD models.

Both the ITS and pre/post methods suffer from similar limitations. In neither case is a control group employed to account for changes common to both those affected by the demonstration and those who are unaffected. Therefore, these methods are less rigorous than a DD analysis. Because of its reliance on time-series data, the ITS can provide a stronger claim at identifying causal effects than a simple pre/post analysis. However, like the DD, both methods can also be confounded by concurrent policy changes unrelated to the demonstration.

D.2 Qualitative Limitations

Though not a limitation, it should be noted that the results of the qualitative analysis will not be statistically representative. However, the findings derived from interviews with multiple subjects across geographic areas will produce information which can be generalized to other settings.

E. Attachments

E.1 Independent Evaluator

Qualifications of the Evaluation Team

The State attests that the relationship between the Contracting Party, Tulane University, shall be, and only be, that of an independent contractor and the Contracting Party shall not be construed to be an employee, agent, or in joint venture with, the State and/or agency. Furthermore, it is a requirement of all publicly funded contracts and agreements to be subject to audit and inspection by the Legislative Auditor of the State of Louisiana, and/or the Office of the Governor, Division of Administration auditors.

We have provided standard NIH-style biosketches for the Tulane University School of Public Health and Tropical Medicine team. The members of the team certify that they do not have any conflict of interest in conducting this evaluation and that they will conduct a fair and impartial evaluation and prepare an objective Evaluation Report.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Diana, Mark L.

eRA COMMONS USER NAME (credential, e.g., agency login): mdiana

POSITION TITLE: Associate Professor, Department of Global Health Management & Policy

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Shenandoah University	BS	1989	Respiratory Care
Shenandoah University	MBA	1994	Health Care Management
Virginia Commonwealth University	MSIS	2003	Information Systems
Virginia Commonwealth University/Medical College of Virginia	PhD	2006	Health Services Organizations & Research

NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.

A. Personal Statement

I am an Associate Professor in the department of Global Health Management & Policy of Tulane University's School of Public Health and Tropical Medicine. My research has focused on the organizational impact of health information systems, primarily in hospitals in the US, and I have recently begun investigating the performance of patient-centered medical homes and accountable care organizations. Most of this work involves the use of large secondary data sets and the conduct of research at the organizational level. I have experience working on the validation of measures of both CPOE and EHR adoption and implementation, which is well suited to this project. I also have experience in funded evaluation work as a co-evaluator of phase II of the Health Information Security and Privacy Collaboration (HISPC) Project, as the principle investigator on the external evaluation of the Louisiana Long-term Care Real Choice Systems Transformation Grant, through the Louisiana Department of Health and Hospitals, as the PI for an evaluation of an electronic health record implementation in Mexico, funded by the

MEASURE Evaluation project of USAID, as the PI for the evaluation of the Louisiana Health Information Exchange, among other projects.

1. Kanger C., Brown L., Mukherjee S., Xin H., **Diana M.L.**, Khurshid A. (2014) Evaluating the Reliability of EHR-Generated Clinical Outcomes Reports: A Case Study. *Generating Evidence & Methods to Improve Patient Outcomes. eGEMS*, 2(3).
2. Kazley, A. S., **Diana, M. L.**, & Menachemi, N. (2011). The Agreement and Internal Consistency of National Hospital EMR Measures. *Health Care Management Science*, 14(4), 303-313.
3. **Diana, M. L.**, Kazley, A. S., & Menachemi, N. (2011). An assessment of Health Care Information and Management Systems Society and Leapfrog data on computerized provider order entry. *Health Services Research*, 46(5), 1575-1591.

B. Positions and Honors

Positions and Employment

1980-1982 Respiratory Therapist, Richmond Memorial Hospital, Richmond, VA
1982-1983 Respiratory Therapy Clinical Coordinator, Humana/St. Luke's Hospital, Richmond, VA
1983-1985 Respiratory Therapist, The Retreat Hospital, Richmond, VA
1985-1986 Supervisor, Respiratory Therapy, Medical College of Virginia Hospitals, Richmond, VA
1986-1987 Respiratory Therapist, Foster Medical Corporation, Richmond, VA
1987-1988 Instructor, Respiratory Therapy, Shenandoah University, Winchester, VA
1988-1995 Director of Clinical Education, Respiratory Therapy, Shenandoah University, Winchester, VA
1995-1999 Director, Respiratory Therapy, Northern Virginia Community College, Annandale, VA
1999-2007 Instructor, Department of Health Administration, VA Commonwealth University, Richmond, VA
2007-2013 Assistant Professor, Department of Health Systems Management and Global Health Systems & Development, Tulane University, New Orleans, LA
2008-2010 MHA Program Director, Health Systems Management, Tulane University, New Orleans, LA
2013-current MHA Program Director, Global Health Systems & Development, Tulane University, New Orleans, LA
2013-current Associate Professor, Drs. W. C. Tsai and P. T. Kung Professor in Health Systems Management, Global Health Systems & Development, Tulane University, New Orleans, LA

Other Experience and Professional Service

2002-current AcademyHealth
2001-current American College of Healthcare Executives (ACHE)
2002-current Health Information Management Systems Society (HIMSS)
2007-current Academy of Management

Honors

2006 James W. Begun Award for Excellence in Doctoral Studies in Health Administration, Department of Health Administration, Virginia Commonwealth University.

C. Contribution to Science

1. My primary contribution is in the area of health information technology (HIT) adoption and use in hospitals, and the effect of hospital HIT adoption and use on quality, safety, and other performance outcomes. I have developed this stream of research in the context of the two seminal IOM reports on safety and quality—*To Err is Human* and *Crossing the Quality Chasm*—and the incentives programs implemented in the HITECH Act. Key findings from this work indicate that achieving quality and safety gains is not an inherent property of HIT, but that there are other factors that work with the technology to achieve the desired outcomes. Identifying those factors remains a high priority. I believe this work has influenced how other researchers, practitioners, and policy makers think about the role of HIT in improving hospital performance. My role in this work has been as a primary investigator or co-investigator in collaboration with a relatively small group of colleagues.
 - a. Burke, D. E., Wang, B., Wan, T. T. H., & **Diana, M. L.** (2002). Exploring hospitals' adoption of information technology. *Journal of Medical Systems*, 26(4), 349-355.
 - b. Kazley, A. S., & **Diana, M. L.** (2011). Hospital computerized provider order entry adoption and quality: An examination of the United States. *Health Care Management Review*, 36(1), 86-94.
 - c. **Diana M.L.**, Harle C.A., Huerta T.R., Ford E.W., & Menachemi N. (2014) Hospitals Characteristics Associated with Achievement of Meaningful Use. *Journal of Healthcare Management*, 59(4):272-284.
 - d. Kazley, A. S., **Diana, M. L.**, & Menachemi, N. (2012). Is EHR Use Associated with Patient Satisfaction in Hospitals? *Health Care Management Review*, 37(1), 23-30.

2. A related contribution to the adoption and use of HIT in hospitals stream of research is on the measurement of HIT adoption and use. My interest in the measurement issue arose from difficulties my colleagues and I encountered in examining the effects of HIT adoption and use. Put simply, the available data sources for examining electronic health record (EHR) adoption and use were rudimentary, and data on components of an EHR, like computerized provider order entry (CPOE) were also, and beyond CPOE virtually non-existent, with the single exception of the Health Information and Management Systems Society (HIMSS) data. I believe the work we did in examining the reliability, validity, and consistency of various measures has contributed to the growing sophistication of measures of HIT adoption and use, but I also believe there is still much work to be done in this area.
 - a. Kanger C., Brown L., Mukherjee S., Xin H., **Diana M.L.**, Khurshid A. (2014) Evaluating the Reliability of EHR-Generated Clinical Outcomes Reports: A Case

- Study. *Generating Evidence & Methods to Improve Patient Outcomes. eGEMS*, 2(3).
- b. Kazley, A. S., **Diana, M. L.**, & Menachemi, N. (2011). The Agreement and Internal Consistency of National Hospital EMR Measures. *Health Care Management Science*, 14(4), 303-313.
 - c. **Diana, M. L.**, Kazley, A. S., & Menachemi, N. (2011). An assessment of Health Care Information and Management Systems Society and Leapfrog data on computerized provider order entry. *Health Services Research*, 46(5), 1575-1591.
3. A third area of research I am developing in collaboration with doctoral students and junior colleagues is examining the performance of new models of health care delivery, specifically patient-centered medical homes (PCMH) and accountable care organizations (ACO). There is a clear relationship between this line of inquiry and my first area, since both of these care models rely on a robust HIT infrastructure to achieve the proposed performance improvements in terms of improved quality, improved care coordination, greater access, and reduced costs. We are in the early stages of this work, but we already have contributed some significant knowledge to the growing literature in this area. I anticipate this line of research to continue to grow.
- a. Yeager, V., Zhang, Y., & **Diana, M.L.** (2015) Analyzing Determinants of Hospitals' Accountable Care Organizations Participation: A Resource Dependency Theory Perspective. *Medical Care Research & Review*. [Accepted for Publication.]
 - b. **Diana, M.L.**, Walker, D.M., Mora, A.M, & Zhang, Y. (2015) Vertical integration strategies in healthcare organizations. *Journal of Health Administration Education*. [Accepted for Publication.]
 - c. Cole, E. S., Campbell, C., **Diana, M. L.**, Webber, L., & Culbertson, R. (2015). Patient-centered medical homes in Louisiana had minimal impact on Medicaid population's use of acute care and costs. *Health Aff (Millwood)*, 34(1), 87-94.

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1jK0j1P7aIG5C/bibliography/48140102/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Support

July 2018 – June 2019

Louisiana State University Center for Healthcare Value & Equity, Louisiana Department of Health Statewide Medicaid Expansion Program Evaluation, \$1,370,541. Role: PI.

July 2018 – June 2019

Louisiana State University Center for Healthcare Value & Equity, Louisiana Department of Health, Medicaid 1115 Substance Use Disorder Demonstration Waiver Evaluation, \$226,991. Role: PI.

Completed Research Support

R03 HS 24637– 01A1(McCoy) 07/01/2017 – 06/30/2018 1.2 calendar
AHRQ \$66,154

EHR-Based Measurement of Care Coordination in an Accountable Care Organization
The purpose of this grant is to implement EHR-based care coordination measures, develop a framework illustrating key domains for measuring care coordination in the ACO context, and map each of the EHR-based measures to the framework domains.

September 2017 – June 2018

Louisiana State University Consortium for Health Transformation, Louisiana Department of Health Statewide Medicaid Expansion Program Evaluation, \$513,391. Role: PI.

October 2014 – December 2015

USAID MEASURE Evaluation project to develop guidance for evaluating health systems strengthening. \$150,000. Role: Investigator (Overall MEASURE Evaluation Project PI: Stacey Gage)

July 2014 – June 2015

Patient Centered Outcomes Research Institute, Louisiana Clinical Research Data Network (LaCDRN). Role: Co-Investigator.

July 2014 – June 2015

Agency for Healthcare Research and Quality (AHRQ), R36 Dissertation Award. Grant Number: 1R36HS023343-01. Hospital Efficiency Changes from Health Information Exchange Participation. \$37,448. PI: Daniel M. Walker. Role: Faculty Advisor.

July 2010 – June 2015

Tulane Quality and Cost Effectiveness Team Initiatives, \$60,000. Role: PI.

July 2013 – June 2014

Agency for Healthcare Research and Quality (AHRQ). Estimating Costs of Supporting Safety-Net PCMH Transformation in New Orleans. \$75,000. Role: Co-investigator.

October 2012 – August 2014

USAID MEASURE Evaluation project to develop metrics for evaluating health systems strengthening. \$310,000. Role: PI on the study (Overall MEASURE Evaluation Project PI: Stacey Gage)

September 2012 – March 2014

Louisiana Health Care Quality Forum, Louisiana Health Information Exchange (LaHIE) Program Evaluation, \$210,350. Role: PI.

June 2011 – September 2012

USAID MEASURE Evaluation project to evaluate the impact of electronic medical records on physician protocol adherence in Colima, MX, Phase 2. Role: PI on the study (Overall MEASURE Evaluation Project PI: Stacey Gage)

April 2011 – November 2011

USAID MEASURE Evaluation project to evaluate electronic medical records in Colima, MX. \$91,035. Role: PI on the study (Overall MEASURE Evaluation Project PI: Stacey Gage)

2008 – 2009 Principal Investigator, "State of Louisiana Long-term Care Transformation," Louisiana Department of Health and Hospitals, Center for Medicare and Medicaid Services, Real Choice Systems Change Grant, \$200,000.

2007 – 2008 Co-evaluator—Health Information Security and Privacy Collaboration Phase 2, Department of Health and Hospitals, State of Louisiana, \$10,000

2002 – 2004 Consultant, AHRQ, Hospital Finances and Quality of Hospital Care.

BIOGRAPHICAL SKETCH

NAME: Kevin Callison

eRA COMMONS USER NAME (credential, e.g., agency login): kcalliso

POSITION TITLE: Assistant Professor of Health Management and Policy

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Ohio State University	B.A.	05/2006	Economics
University of Illinois at Chicago	M.A.	06/2008	Economics
University of Illinois at Chicago	Ph.D.	06/2013	Economics

A. Personal Statement**B. Positions and Honors**

Positions and Employment

2006 – 2013: Teaching Assistant, Department of Economics, University of Illinois at Chicago, Chicago, IL
2007 – 2013: Research Assistant, Department of Economics, University of Illinois at Chicago, Chicago, IL
2013 - 2017: Assistant Professor, Department of Economics, Grand Valley State University, Grand Rapids, MI
2017 - Present: Assistant Professor, Department of Global Health Management and Policy, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA

Professional Memberships

2013 - Present: Member, American Economic Association
2013 - Present: Member, American Society of Health Economists
2016 - Present: Member, Southern Economic Association
2016 - Present: Member, International Health Economics Association

Honors

2016: W.E. Upjohn Institute for Employment Research Early Career Research Award

C. Contributions to Science

My contributions to the field are concentrated in three general areas of study:

1. Health policy evaluation – My current research efforts are primarily focused on the analysis of recent policy interventions that aim to improve population health. I have a strong interest in evaluating the effects on health and labor market outcomes of the Affordable Care Act's Medicaid expansion and have documented heterogeneous impacts of the expansion across race and ethnicity. I am currently a Co-Investigator on a project sponsored by the State of Louisiana to document changes in health care access and outcomes associated with the state's Medicaid expansion in 2016. Examining a health insurance expansion in a developing country setting, my coauthors and I found evidence of substitution away from traditional forms of health care and towards the use of modern care. These papers complement and add to a body of research concerning the relationship between insurance expansions and the use of care. In a separate policy evaluation, my coauthor and I presented the first evidence on the effectiveness of donor registry laws and first-person consent legislation on the supply of deceased organ donors. This represents a critical area of study as the demand for transplantable organs has far surpassed the available supply and continues to grow at a steep rate. I am in the process of continuing my work on organ failure by examining the effect of recent legislation that penalizes dialysis facilities for poor patient outcomes. Finally, along with Dr. Pesko, I have recently finished conducting an evaluation of state and local paid sick leave mandates in the U.S. Little is known about the health and labor market effects of paid sick leave mandates in the U.S. setting and, therefore, this work has the potential to provide a significant contribution to an emerging policy debate as well as provide support for the successful completion of the proposed research project.

- a. Callison, K. & Levin, A. 2016. Donor Registries, First-Person Consent Legislation, and the Supply of Deceased Organ Donors. *Journal of Health Economics*, 49: 70-75.
- b. Callison, K. & Sicilian, P. Economic Freedom and the Affordable Care Act: Medicaid Expansion and Labor Mobility by Race and Ethnicity. *Public Finance Review*, forthcoming.
- c. Abrokwah, S.O., Callison, K., & Meyer, D.J. 2017. Social Health Insurance and the Use of Modern and Traditional Care in Developing Countries: Evidence from Ghana's National Health Insurance Scheme. *Journal of Development Studies* (in press).
- d. Callison, K. & Pesko, M.F. (2017). The Effect of Paid Sick Leave Mandates on Access to Paid Leave and Work Absences. Upjohn Institute Working Paper No. 16-265. DOI: 10.17848/wp-265.

2. Health determinants and substance abuse – My research in this area initially addressed links between adolescent and adult health and explored factors that contributed to substance abuse early in life. These studies contributed to a growing body of evidence on the role of individual non-cognitive factors and external influences in adolescence on health outcomes later in life. Building on these earlier studies, I have analyzed the relationship between cigarette taxes and tobacco use for adults and conducted an examination of the mechanisms underlying addiction and substance use. These are certainly timely issues and will continue to be an area of focus as I advance in my career.

- a. Kaestner, R. & Callison, K. (2011). Adolescent Cognitive and Non-Cognitive Correlates of Adult Health. *Journal of Human Capital*, 5(1): 29-69.
- b. Kaestner, R., Lo Sasso, A., Callison, K., & Yarnoff, B. (2013). Youth Employment and Substance Use. *Social Science Research*, 42(1): 169-185.

- c. Callison, K. & Kaestner, R. (2014). Do Higher Tobacco Taxes Reduce Adult Smoking? New Evidence of the Effect of Recent Cigarette Tax Increases on Adult Smoking. *Economic Inquiry*, 52(1): 155-172.
- d. Kaestner, R. & Callison, K. (2018). An Assessment of the Forward-Looking Hypothesis of the Demand for Cigarettes. *Southern Economic Journal* (in press).

3. Health care use and the organization of health insurance markets – My interest in the organizational aspects of health care delivery developed early-on in my research career. My dissertation work considered the implications of geographic variation in health care expenditures and I have continued to investigate this topic. Relatedly, I have explored the interaction between health insurance coverage, reimbursement levels, and the use of health care services. I am particularly interested in the role of private insurance plans in the financing of Medicare benefits, an area of increasing importance as the share of privately enrolled Medicare beneficiaries continues to grow. Finally, my work has extended to interdisciplinary efforts to evaluate care coordination interventions for highly complex hospital patients.

- a. Callison, K. (2016). Medicare Managed Care Spillovers and Treatment Intensity. *Health Economics*, 25(7): 873-887.
- b. Hardin, L., Kilian, A., Muller, L., Callison, K., & Olgren, M. (2016). Cross-Continuum Tool is Associated with Reduced Utilization and Cost for Frequent High-Need Users. *Western Journal of Emergency Medicine*, 18(2).
- c. Callison, K. & Nguyen, B.T. (2018). The Effect of Medicaid Physician Fee Increases on Patients' Health Care Access, Utilization, and Expenditures. *Health Services Research*, 53(2): 690-710.

Complete List of Published Work in My Bibliography:

<https://www.ncbi.nlm.nih.gov/sites/myncbi/1h19pOKfooDQA/bibliography/54023620/public/?sort=date&direction=ascending>

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

Carol Lavin Bernick Faculty Grant Callison (PI)
4/26/2018 – 4/26/2019

Hospital Competition and Quality of Care

This is an internal, competitive research grant that is funding a project examining hospital response to the introduction of Medicare's Hospital Readmissions Reduction Program by degree of market concentration.

Louisiana Department of Health Diana (PI)
9/1/2017 – 6/30/2018

Evaluation of Louisiana's Medicaid Expansion

The project will evaluate the initial effects of the expansion of the Louisiana Medicaid program on state residents, the economy, and the Louisiana health care delivery system.
Role: Co-I

Departmental Start-Up Grant, Tulane University Callison (PI)
7/1/2017 – 7/1/2023
Research Start-Up Funds

This is an internal grant designed to provide financial resources that will aid in the development of an independent research agenda. Funds are designed to be used for data acquisition, conference attendance, and computing resources.

Completed Research Support

W.E. Upjohn Institute Early Career Research Award Callison (PI)
10/7/2016 – 11/7/2017

The Effect of Paid Sick Leave Mandates on Access to Paid Leave and Work Absences

Funding to pursue a preliminary evaluation of changes in paid sick leave coverage and worker absences following the enactment of local mandates requiring employers to offer paid sick leave benefits.

Role: PI

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Janna Wisniewski

eRA COMMONS USER NAME (credential, e.g., agency login): jwisnie

POSITION TITLE: Research Assistant Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Michigan State University	BA	05/2006	Linguistics
Tulane University	MHA	12/2009	Health administration
Tulane University	PhD	08/2016	Public health

A. Personal Statement

My training, expertise, and experience both in health services delivery and qualitative research qualify me to complete this research project. I have a broad background in health services research, particularly in the areas of service quality and health workforce. I have designed, implemented, and published research involving primary qualitative data collection through key informant and in-depth interviews with health service providers and patients. I have experience using qualitative findings to build theory and inform interventions. Examples of my work include a study examining provider satisfaction and motivation in the Democratic Republic of Congo using interviews and focus groups, for which I am the Principle Investigator, an analysis of dissatisfaction in the public health workforce in the United States based on qualitative survey data, and an evaluation of the Louisiana Medicaid expansion involving physician and beneficiary interviews.

B. Positions and Honors**Positions**

2008	Operations and Billing Specialist, Tulane Community Health Centers
2009	Administrative Resident, Department of Business Development and Strategic Planning, East Jefferson General Hospital
2010 – 2011	Administrative Fellow, St. Luke's Episcopal Health System
2011 – 2013	Manager of Credentialing Oversight, St. Luke's Episcopal Health System
2013 – 2016	Doctoral Student and Research Assistant, Tulane University, School of Public Health and Tropical Medicine

2016 – present Research Assistant Professor, Department of Global Health Management and Policy, Tulane University School of Public Health and Tropical Medicine

Honors

2007 Dean’s Grant for Graduate Studies, Tulane University School of Public Health

2013 Chair’s Scholarship for Doctoral Studies, Tulane University School of Public Health

2016 Best poster in category of “Engaging Power and Politics,” Fourth Global Symposium on Health Systems Research, Vancouver, BC

C. Contributions to Science

1. **Identification of Strategies that Increase Health Service Utilization in Post-Conflict Settings.** Through my work in the Democratic Republic in Congo, I am studying ways in which access to quality health services can be promoted in post-conflict settings. I began by ascertaining the importance of quality to these populations; my dissertation focused on the relationship between quality and utilization of maternal health services. I found that patients assess service quality accurately when they are exposed to the aspect of quality and understand its importance, and that higher quality is associated with higher utilization of antenatal care. I am currently evaluating the potential for communities to hold providers accountable for service quality; preliminary findings show success at the local level.
 - a. Wisniewski, J.M., Diana, M.L., Yeager, V.A., Hotchkiss, D.R. "Comparison of Objective Measures and Patients’ Perceptions of Quality of Services in Government Health Facilities in the Democratic Republic of Congo." *International Journal for Quality in Health Care*, 2018, 1-8 doi: 10.1093/intqhc/mzy052.
 - b. Wisniewski, J.M., Diana, M.L., Yeager, V.A., Hotchkiss, D.R. "The Relationship Between Quality and Utilization of Health Services in the Democratic Republic of Congo," Tulane University Press, 2016.

2. **Discovery of Factors Motivating Retention of Public Health Workforce.** I have published several papers examining the factors that matter in the recruitment and retention of the public health workforce. This work has shown that contrary to conventional thinking, salary level is less important to recruitment and retention than other largely modifiable factors such as having a variety of job tasks and opportunities for training and growth. Findings also indicate that public health workers associate dissatisfying factors such as heavy workloads and a lack of training with their abilities to provide high-quality services.
 - a. Wisniewski, J.M., Jacinto, C., Yeager, V.A., Castrucci, B., Chapple-McGruder, T., Gould, E. "Opportunities to Improve Employee Satisfaction within State and Local Public Health Agencies." *Journal of Public Health Management and Practice*, 2018. Accepted.

- b. Yeager, V.A., Wisniewski, J.M., Chapple-McGruder, T., Castrucci, B., Gould, E. “Public Health Workforce Self-Identified Training Needs by Jurisdiction and Job Type.” *Journal of Public Health Management and Practice*, 2018. In press.
 - c. Yeager, V.A. and Wisniewski, J.M. “Factors That Influence the Recruitment and Retention of Nurses in Public Health Agencies.” *Public Health Reports*, 2017, 132(5):556-562. PMID: 28792856.
 - d. Yeager, V.A., Wisniewski, J.M., Amos, K., and Bialek, R. “Why Do People Work in Public Health? Exploring recruitment and retention among public health workers.” *Journal of Public Health Management and Practice*, 2016, 22(6):559-556.
 - e. Yeager, V.A., Wisniewski, J.M., Amos, K., and Bialek, R. “What Matters in Recruiting Public Health Employees: Considerations for Filling Workforce Gaps.” *American Journal of Public Health*, 2015, 105(12), e33-6. PMID: 26469672.
3. **Strengthening of Monitoring and Evaluation Methodology.** Based on interviews with leaders in international development, I developed recommendations to improve the monitoring and evaluation of health systems strengthening approaches.
- a. Wisniewski, J.M., Yeager, V.A., Diana, M.L., Hotchkiss, D. “Exploring the Barriers to Rigorous Monitoring and Evaluation of Health Systems Strengthening Activities: Qualitative Evidence from International Development Partners.” *Journal of Health Policy and Planning*, 2016. <https://doi.org/10.1002/hpm.2339>.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

Carol Lavin-Bernick Faculty Grant Wisniewski (PI) 06-2017- present
 Racial and ethnic disparities in wait times for medical appointments
 The objective of this research is to determine whether racial and ethnic minorities wait longer for medical appointments than non-minorities in an urban area of the United States.
 Role: Principle investigator

Louisiana Department of Health Diana (PI) 09/2017- present
 Evaluation of Louisiana’s Medicaid expansion
 This project will evaluate the initial effects of the expansion of the Louisiana Medicaid program on state residents, the economy, and the Louisiana health care delivery system.
 Role: Co-investigator

Blue Cross Blue Shield Foundation of Louisiana Wisniewski (PI) 01/18- present
 Evaluation of 504HealthNet’s Improving Health Equity in New Orleans through Community Based Care, Outreach, and Education project
 The purpose of this work is to evaluate the impact of a behavioral and system-level intervention on access to and utilization of health services among low income communities and people of color in New Orleans.
 Role: Principle investigator

UK Department for International Development Keating (PI) 03/2013- present
Assessing the impact of the ASSP project in the Democratic Republic of Congo
The purpose of this study is measure the impact of a broad package health system strengthening intervention on health outcomes, behaviors, and exposure to and use of health interventions, and to assess the impact of the overall project on selected health outcomes, behaviors, and health service utilization.
Role: Co-investigator

UK Department for International Development Wisniewski (PI) 03/2013- present
Impact of a simplified community scorecard approach in the Democratic Republic of Congo
The purposes of this study are to monitor the implementation of the simplified community scorecard intervention and offer recommendations for strengthening the intervention's approach, track changes over time in the participating communities' perceptions of quality of health services, communities' utilization of health services, and real changes in the supplies, equipment, and services available at their health facilities, describe the characteristics of a successful or unsuccessful site, and assess unintended effects of the intervention.
Role: Principle investigator

De Beaumont Foundation Yeager (PI) 04/2016- present
Qualitative study of the public health workforce
The purpose of this work is to document the level of job satisfaction and motivation of the United States public health workforce, describe the factors associated with satisfaction and dissatisfaction, and understand the impacts on productivity and quality.
Role: Co-investigator

United States Agency for International Development Yukich (PI) 04/2017- present
Costs of continuous long lasting insecticide-treated net distribution strategies in sub-Saharan Africa
Tulane is conducting a series of studies related to the cost-effectiveness of various strategies for malaria control using LLIN's. These studies are comprised of 1) a case series of costing for continuous distribution strategies, 2) a review a meta-analysis of existing and new cost effectiveness data, 3) simulations of effects using OpenMalaria, and 4) cost-effectiveness comparisons.
Role: Co-investigator

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Stoecker, Charles

eRA COMMONS USER NAME (credential, e.g., agency login): cfstoecker

POSITION TITLE: Assistant Professor of Health Economics

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Harvard University	B.A.	05/03	Economics
University of California, Davis	M.A.	05/08	Economics
University of California, Davis	Ph.D.	05/11	Economics
Centers for Disease Control and Prevention	Post-doc	05/13	Health Economics

A. Personal Statement**B. Positions and Honors****Positions and Employment**

2003-2004 Research Assistant to Jonathan Gruber for cost projections for National Health Insurance Reform, Massachusetts Institute of Technology, Cambridge, MA
 2006-2007 Research Assistant to Jonathan Gruber for cost protections for Health Insurance Reform in CA and CT, National Bureau of Economic Research, Cambridge, MA
 2006-2008 Research Assistant to Hilary Hoynes for the impact of Food Stamps on natality and mortality, University of California, Davis, CA
 2011-2013 Steven M. Teutsch Prevention Effectiveness Fellow, Centers for Disease Control and Prevention, Atlanta, GA
 2013- Assistant Professor, Department of Global Health Systems and Development, Tulane University, New Orleans, LA

Honors

2018-present J.P. Morgan Chase Chair in Healthcare Finance
 2017 Best Abstract Medicare Section, Academy Health Conference, 2017
 2014 Kaffee Billah Award for Excellence in Economic Research, Centers for Disease Control and Prevention, Atlanta, GA

C. Contributions to Science**1. Natural Experiments used to Evaluate Health Policy Changes**

As an applied econometrician I have led or coauthored several studies that exploit natural experiments to examine the health impacts of policy changes. I have exploited variation in playoff success to determine the impacts of National Football League teams on local influenza mortality. I used a differences-in-differences framework to examine this question. I have used contingent choice methods to quantify the financial impacts of policies restricting access to nasal decongestants in pharmacies. I have also used policy-induced variation in economic sanctions induced by the Clean Air Act to examine the impacts of pollution fetal and maternal health. This study used a regression discontinuity design that exploited the fact that the EPA established thresholds for air pollution and imposed sanctions on counties over those thresholds. I have extensive experience applying natural experiments to a variety of questions.

- a. Stoecker, C, Sanders, NJ, & Barreca, A. *Success is Something to Sneeze at: Influenza Mortality in Regions that Send Teams to the Super Bowl.* *American Journal of Health Economics* 2(1) (2016):125-143.
- b. Finlay, K, Stoecker, C, & Cunningham, S. "Willingness-To-Accept Pharmaceutical Retail Inconvenience: Evidence from a Contingent Choice Experiment." *PLoS ONE* 10(5) (2015): e0126790.
- c. Sanders, NJ & Stoecker, C. "Where Have all the Young Men Gone? Using Sex Ratios to Measure Fetal Death Rates." *Journal of Health Economics* 41 (2015): 30-45.
- d. Lindo, JM, and Stoecker, C. Drawn into Violence: Evidence on "What Makes a Criminal" from the Vietnam Draft Lotteries. *Economic Inquiry* 52(1) (2014): 239-258.

2. Cost-effectiveness of Reducing Vaccine Schedules for Children

My early publications directly addressed the fact that the United States does not have a cost-effective recommended vaccination schedule for pneumococcal vaccine for children. While many other industrialized countries use a 3 dose schedule, the United States spends approximately \$500 million per year on a 4th dose that does very little to improve outcomes. In order to investigate this I developed a model to calculate pneumococcal disease incidence and costs for children. The model tracked outcomes and QALYs through life expectancy. As the model was developed we realized the key input would be the relative effectiveness of the two dosage schedules against otitis media. As no studies had previously examined this we performed propensity score matching on insurance claims data to get a better estimate of the impact of a reduced dose schedule. This work has sparked numerous policy discussions within CDC and FDA and other regulatory agencies that are currently ongoing. I developed the cost-effectiveness model, performed the propensity score matching, and served as the primary investigator for these studies.

- a. Stoecker, C, Hampton, L, Link-Gelles, R, Messonnier, M, Zhou, F, & Moore, M. (2013). Cost-effectiveness of using 2 vs 3 primary doses of 13-valent pneumococcal conjugate vaccine. *Pediatrics*, 132(2), e324-e332.
- b. Stoecker, C, Hampton, L, & Moore, M. (2012). 7-valent pneumococcal conjugate vaccine and otitis media: Effectiveness of a 2-dose versus 3-dose primary series. *Vaccine*, 30(44), 6256-6262.

3. Cost-effectiveness of Expanded Vaccination Recommendations for Adults

Adults experienced large declines in incidence of pneumococcal disease caused by serotypes included in the conjugate vaccine. My next projects investigated the cost-effectiveness of including the conjugate vaccine for adults compared to relying on herd immunity protections conferred to adults by the childhood vaccination program. The first study found introducing the vaccine for a particularly susceptible population of adults was cost-saving. After new data emerged on the effectiveness of the vaccine against

pneumococcal pneumonia emerged, we conducted cost-effectiveness analysis for the general adult population. We found a new recommended vaccine schedule would be cost-effective in the short term, but in the long-term the costs were very high compared to the benefits. Both of these studies led to changes in the recommended vaccine schedule for adults, with the recommendation that the cost-effectiveness of the recommendation for the general population be regularly monitored. I helped develop the cost-effectiveness model for susceptible adults, and developed the model for the general adult population. I served as primary investigator for the study on the general adult population and co-primary investigator on the study of particularly susceptible adults.

- a. Cho, B., Stoecker, C, Link-Gelles, R, & Moore, M. (2013) Cost-effectiveness of administering 13-valent pneumococcal conjugate vaccine in addition to 23-valent pneumococcal polysaccharide vaccine to adults with immunocompromising conditions. *Vaccine* 31, 6011-6021.
- b. Tomczyk, S, Bennet, NM, Stoecker, C. et al. (2014) "Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine among adults aged \geq 65 years: recommendations of the Advisory Committee on Immunization Practices (ACIP)." *MMWR Morb Mortal Wkly Rep* 63.37: 822-5.

Complete List of Published Work in My NCBI:

https://www.ncbi.nlm.nih.gov/sites/myncbi/1ZCkoZq_75yAz/bibliography/51516730/public/?sort=date&direction=ascending

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

Centers for Disease Control and Prevention 17IPA1711958 Stoecker (PI) 05/01/17 – 05/10/18

The Impacts of Herd Immunity from the Child Immunization Program on the Need for Universal Adult Pneumococcal Conjugate Vaccination

The goal of this project is to evaluate the health and economic consequences of removing pneumococcal conjugate vaccine from the recommended schedule for adults in the context of herd immunity impacts from the children's immunization schedule.

Role: Principal Investigator

R01 1R01HD086794 Kissinger (PI) 07/01/16 – 06/30/21

A New Approach to Controlling Chlamydia Transmission in Young People

The goal of this project is to evaluate the effectiveness and cost-effectiveness of a strategy to increase Chlamydia treatment in the community.

Role: Co-I

PCORI NEN-1508-32257 Shi (PI) 07/01/16 – 06/30/21

Natural Experiments of the Impact of Population-targeted Health Policies to Prevent Diabetes and its Complications

The goal of this project is to evaluate the impact of care coordination on health outcomes and utilization measures for patients with multiple chronic conditions using a regression discontinuity and differences-in-differences framework.

Role: Co-I

World Food Program WFP/BAN/RFP/15/29 Hutchinson (PI) 09/01/15 – 10/01/19
Strategic and Technical Support to Panel Survey VGD Programme Beneficiaries in Bangladesh

The goal of this project is to evaluate the impact of an income support program in Bangladesh using panel data methods.

Role: Co-PI

Gates Foundation Hutchinson (PI) 11/01/16 – 10/31/18
Impact Assessment of Social Marketing in Ghana

The goal of this project is to use econometric techniques to evaluate the impact of an anti-smoking intervention on teenage girls in Ghana.

Role: Co-I

Gates Foundation Hutchinson (PI) 12/01/16 – 11/30/18
MTV Shuga for Family Planning in Nigeria

The goal of this project is to develop econometric techniques to evaluate the effectiveness of a television campaign on contraceptive use in Nigeria.

Role: Co-I

Completed Research Support

Centers for Disease Control and Prevention 16IPA1612239 Stoecker (PI) 05/11/16 – 05/10/17

Cost-effectiveness of RSV

The goal of this project was to evaluate the cost effectiveness and model the health consequences of a potential new vaccine against RSV.

Role: Principal Investigator

Centers for Disease Control and Prevention 15IPA1512583 Stoecker (PI) 05/11/16 – 05/10/17

Cost-effectiveness of Adding a Universal Recommendation of Pneumococcal Conjugate Vaccine for All Adults

The goal of this project was to provide economic modeling for immunization schedule questions regarding pneumococcal disease.

Role: Principal Investigator

E.2 Evaluation Budget and Project Roles

E.3 Timeline and Major Milestones

References:

Buchanich, J., L.C. Balmert, K.E. Williams, and D.S. Burke. (2018). The Effect of Incomplete Death Certificates on Estimates of Unintentional Opioid-Related Overdose Deaths in the United States, 1999-2015. *Public Health Reports*, 133(4): 423-431.

Centers for Disease Control and Prevention (2018). U.S. Opioid Prescribing Rate Maps. <https://www.cdc.gov/drugoverdose/maps/rxrate-maps.html>.

Kaiser Family Foundation State Health Facts. (2018). Opioid Overdose Death Rates and All Drug Overdose Death Rates per 100,000 Population (Age-Adjusted). <https://www.kff.org/other/state-indicator/opioid-overdose-death-rates/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D>

Musumeci, M. (2018). Key Questions about Medicaid Payment for Services in Institutions for Mental Disease. *Kaiser Family Foundation June 2018 Issue Brief*.

Priest, K.C., A.W. Leof, D. McCarty, and V. King. (2017). Medicaid Coverage for Residential Substance Use Disorder Treatment: Addressing the Institution for Mental Disease Exclusion Policy. *Health Affairs*, DOI: 10.1377/hblog20170831.061745.