The University of New Mexico

Pathways to a Healthy Bernalillo County Program – A Cost Study

Prepared for Pathways to a Healthy Bernalillo County, Community Health Worker Initiatives

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1. Introduction

Determinants of health go beyond health care and availability of adequate health insurance. Rather, health is also determined by the interplay of factors relating to the social and economic environment, health services and the person's individual behavior (World Health Organization, Health Impact Assessment)[1]. Specifically, these factors include education, income level, employment, social support, transportation options, housing options, personal health behaviors, access to health care and services, and race and ethnicity. These factors are, in turn, shaped by large-scale social, political, and economic forces which create and sustain inequitable distributions of power, money, and resources around the world (Marmot et al. 2008).

Compared to individuals with higher incomes, those with lower incomes have poorer health and a greater risk of mortality due to fewer options for getting and staying healthy such as inadequate nutrition, lack of quality health care, inability to afford health insurance coverage and inability to reside in safe and healthy communities (Bernalillo County Health Assessment)[2]. The incapacity to promote or maintain health through one's socioeconomic resources increases vulnerability to illness even as disease prevalence and biological dispositions fluctuate across space and time (Link and Phelan 1995; Phelan, Link, and Tehranifar 2010). In addition, adults who either had gaps in their insurance or were underinsured reported problems with medical bills at over twice the rate of those who were adequately insured year round (Collins et al., 2008). Lack of coverage was found to also impact whether an individual was able to get needed care if an individual took medications as prescribed or skimped on them. It also contributed to increased usage in emergency services and overnight stays (Collins et al., 2008). Furthermore, being uninsured can result in service barriers including the patient's insurance type, limits on coverage, and inability to pay up front for services, impacting their access to a variety of services including diagnostic tests, medical specialists, specialized services, hospital admissions, high-tech services, mental health services, and substance abuse services (Cook et al. 2007). Research has also found that people with fewer years of education and those who live in poorer or substandard neighborhoods have shorter life expectancies and worse overall health outcomes (North Carolina Institute of Medicine, 2009).

These key socioeconomic factors also predict health in a community. For Bernalillo County in New Mexico, however, most of these health indicators though higher than the overall New Mexico average is lower than the U.S averages. For instance, median household income in Bernalillo County was $48,398 in 2013 compared to $64,719 in the U.S. Bernalillo County is the geographic and economic center of the state. The County seat is Albuquerque, the most populous city in New Mexico (Bernalillo County website)[3]. With a population of 674, 221 in 2013,

[1] http://www.who.int/hia/evidence/doh/en/ (Last accessed 12/07/2014)
[2] http://www.bchealthcouncil.org/Resources/Documents/CINCH%20Health%20Assessment%2012-18-12.pdf (Last accessed 12/25/2014)
[3] http://www.bernco.gov/

Bernalillo County accounts for almost one-third of the population in New Mexico (United States Census Bureau)[4]. Table 1 presents the 2013 averages of selected health indicators for Bernalillo County compared to their averages in New Mexico and in the United States. As shown in the table, approximately 17% of the county's civilian non-institutionalized population is uninsured and almost one-third of the county's populations make less than $23,000. In addition, Hispanics constitute the largest portion of the population, 49%. Compared to non-Hispanic Whites, racial and ethnic minorities are more likely to have family incomes less than the federal poverty line, less likely to have a high school education and less likely to have had a health care visit in the previous year (Doty, M. et al. 2002, James, C. et al. 2003).

Table 1: Health Indicators

Indicators	Bernalillo County	New Mexico	U.S.
Race (2014)			
American Indian and Alaska Native alone	5.8%	10.4%	1.2%
Black or African American alone	3.4%	2.5%	13.2%
Hispanic or Latino	49.0%	47.7%	17.4%
Asian alone	2.7%	1.7%	5.4%
Non-Hispanic Whites	40.2%	38.9%	62.1%
Education			
High school graduate, 25+ years (2009-2013)	23.9%	26.4%	28.1%
Bachelor's degree, 25+ years (2009-2013)	17.5%	14.7%	18.0%
Graduate or professional degree, 25+ years (2009-13)	14.3%	11.1%	10.8%
Employment and Income			
Employed	59.6%	55.2%	57.6%
Unemployed	5.2%	5.5%	6.2%
Median household income, 2009 – 2013	$48,398	$44,886	$64,719
Per capita income, 2009 – 2013	$26,766	$23,749	$28,155
Persons below poverty level (%)	18.0%	20.4%	14.9%
Housing			
Homeownership rate, 2008 – 2012	63.5%	68.7%	65.5%
Health insurance			
No health insurance coverage, 2008- 2012	17.0%	19.6%	14.9%

Source: U.S. Census Bureau: American Community Survey. Retrieved 12/05/2014.

[4] http://quickfacts.census.gov/qfd/states/35/35001.html

2. Brief Description of the Pathways Program

The Pathways to a Healthy Bernalillo County Program is an initiative developed to connect the most difficult-to-reach (mostly low-income, uninsured) adult populations in the County to various health and social factors that will improve their health and well-being. The Pathways program derived from a care coordination program developed in Ohio and is currently modeled in more than sixteen different partners across the U.S. (Urban Health Partners, 2013). The program is administered through the University of New Mexico Health Sciences Center (HSC), Community Health Worker Initiatives (the Hub) under an agreement between the University of New Mexico Hospital (UNMH) and the Health Sciences Center. Per this agreement, UNMH has agreed to provide funding that began in 2009 and will continue through 2017 in the amount of no less than $800,000 per year. The majority of this fund is distributed to community organizations based on a competitive application process.

Imbibed within the context of a "Find-Treat-Measure", the primary goal of the Pathways Program is to select participants especially those at greater risk, connect them to treatment and services, and document and evaluate the outcomes. It is expected that the program will have a positive impact not only on the participants but also on the Bernalillo County community as a whole, in the long run. A unique contribution of *The Pathways Program* is that it takes a more inclusive view on factors that can impact health and provides a wide variety of pathways for a broader clientele. Specifically, it recognizes the importance of social issues as well as traditional health issues.

Pathways clients or participants are selected based on a risk scoring instrument covering a selected variety of twenty-four health and social predictors of extreme poverty and vulnerability. The questionnaire assesses factors such as unemployment, basic needs such as food and clothing, homelessness, visits to the hospital or the ER, medical care affordability, dental problems, family crisis, previous incarceration and emotional, drug or alcohol problems. The Pathways to a Healthy Bernalillo County Program focuses its efforts in the southern part of the county where the health indicators are among the worst in the state. The twenty-one pathways are presented in Table 2.

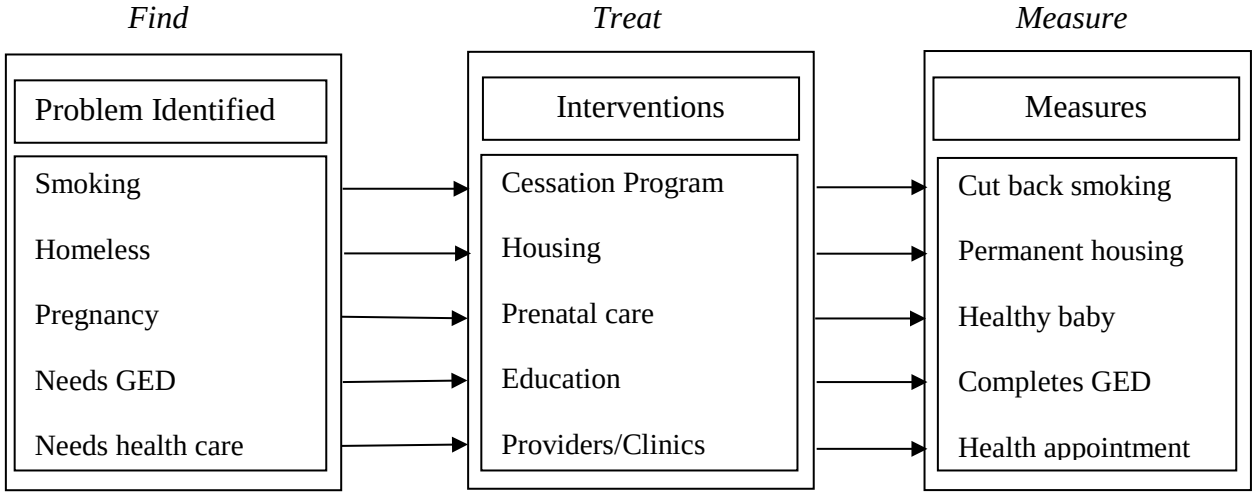
Table 2: Pathways

Pathways		
Behavioral Health	Education/GED	Income Support
Child Care	Employment	Legal Services
Child Support	Food Security	Medical Debt
Dental Care	Health Care Home	Pharmacy/Medications
Disability Income/Appeal	Heat & Utilities	Substance Use/Abuse
Domestic Violence	Homelessness Prevention	Transportation
Driver's License/I.D.	Housing	Vision & Hearing

The Pathways Program utilizes Navigators, who are community health workers employed by network members, to provide assessments for individuals referred to the program (Agency for Healthcare Research and Quality, 2010, p. 2). Once a potential client is identified and consents to participate, he or she is enrolled and then assigned to a Navigator. The Navigator then helps to determine which of the client's needs are most pressing and helps clients to complete one or more of the twenty-one pathways by providing referrals to community organizations, both in and out of the network (Agency for Healthcare Research and Quality, 2010). Clients may be assigned to more than one pathway depending on the problems identified. It is in the variety of pathways that the Pathways Program stands out among others. While a number of pathways deal directly with health issues, others involve the overall wellbeing of the individual to improve their health in less direct, but still important ways.

The figure below provides an illustration of the "find-treat-measure" approach of *The Pathways Program.*

Figure 1: "Find-Treat-Measure approach of *The Pathways Program*



Source: Agency for Healthcare Research and Quality, 2011

3. Prior Cost Studies on the Pathways Model

The Pathways model has been utilized in a number of communities. Examples include the *Rural and Urban Access to Health* in Indiana, *Lincoln's ED Connections* program in Nebraska, *Community Health Access Project* (CHAP) in Ohio, *Access El Dorado* (ACCEL) in California, *Access Project* in Rwanda, *Healthy Moms & Babes* in Ohio, *Project Access Dallas* in Dallas, *Muskegon Community Health Project* in Michigan, *Rio Arriba County Pathways Pilot Project* in New Mexico, *Michigan Pathways to better health initiative* in Michigan, *Central Oklahoma Project Access Program* in Oklahoma and *St. Vincent Health* in Indiana. Most of these programs have pathways that typically focus directly on health care.

The *Rural and Urban Access to Health* is a collaboration program by eight St. Vincent Health's hospitals. The program addresses the needs of underserved at-risk population, including Hispanic migrant workers and immigrants, in nine counties in central Indiana. It works to provide safety net services by focusing on outreach, providing support and working to connect clients with services via six pathways: Diabetes, Enrollment, Medical home, Medical referral, Pregnancy, and Social services (Agency for Healthcare Research and Quality, 2009). The *Lincoln's ED Connections* serves clients who are uninsured and underinsured with the goal of improving health outcomes and reduce reliance on emergency services. *Project Homeless Connect* (*PHC)* is a program model that began in San Francisco and has since spread to other cities. The program promotes the organization of one day events that gather service providers in a single location to help connect the homeless with services. These one day events provide services such as housing, medical care, SSI benefits, employment counseling, legal advice, and food.

While the *Pathways to a Healthy Bernalillo County Program* adheres to the Pathways model, it stands out among other programs. While other programs have pathways that typically focus most directly on health care, t*he Pathways to a Healthy Bernalillo County Program* works to address factors that are both directly and indirectly related to health care. This broad view allows for flexibility in addressing the needs of clients but makes it difficult to compare *The Pathways Program* to other programs based on the pathways model.

Some of these pathways programs have conducted program evaluations to evaluate cost outcomes or other outcomes from the program. *Project Access Dallas* determined that the program resulted in a reduction in emergency department visits, yielding a savings of $553,375 in 2005 and that the reduction in inpatient hospital days amounted to an additional savings of $890,897 (The Institute for Faith Health Research, 2005). Their analysis reported a savings of $3 dollars in hospital costs for every $1 in programming costs. While no model is exactly like *The Pathways Program*, other evaluations have the potential to provide helpful information. A comparison between Housing First, which is based in part on the Pathways model, and Continuum of Care (CoC) programs measured success based on reducing homeless, reducing

psychiatric hospitalization and a comparison of costs for a two- year time period (Gulcur et al. 2003). Individuals assigned to Housing First spent less time on the streets and in psychiatric hospitals than those assigned to CoC programs, especially for those recruited from the streets when compared with those recruited in hospitals. No matter where the individual was recruited, the cost of those in the CoC programs was higher than those in the Housing First program. Further, determined savings were greatest during the first year with the cost between groups converging during the next year (Gulcur et al. 2003). Similarly, An evaluation of the *Lincoln's ED Connections* program indicates that it reduced visits by participants by 68% (from 2100 visits to 693) from enrollment date to 12 months post enrollment. In addition, emergency department charges also decreased by 38% (from $1.8 million to $579,000)[5].

The main objective of this cost study is to estimate the efficacy of Pathways as reflected in two major outcomes – total UNMH hospital group charges and total number of visits to UNMH hospital group sites. From an initial pre and post comparison cost study conducted, we found that both total charges and visits for Pathways clients increased from the pre period to the post period across a variety of participants, type of care, services and diagnoses. A potential explanation for this observed increase is the possibility that the Pathways program provided a pathway to care that was not previously available to the program's client. Further, a study with a matched comparison group would allow us to better understand if these increases are specific to the Pathways population or are more general by comparing the costs to a control group. Therefore, rather than a direct comparison of each outcome pre- and post- program in Pathways clients (as previously done), a cost estimation technique is used where Pathway participants are matched with a selected control group of non-Pathways clients with similar or comparable characteristics. This method is better suited in analyzing the impact or benefits of a program with a non-random selection of the participants, like Pathways. It infers the benefits of the program by estimating what the outcomes would have been for the Pathways clients if they had never participated in the program.

4. Social and Economic Determinants of Health

Beyond prior cost studies of the pathways model, further research demonstrates the general salience of social and economic factors for determining health outcomes. As the program's pathways specifically target many such factors, this body of literature provides indirect support for the program's ability to diminish care costs by improving health. Seminal in this regard is Link and Phelan's (1995) conceptualization of social conditions as distal yet fundamental determinants of health. Their theoretical framework makes two contentions. First, so-called "risk factors" for disease need to be understood as conditions in contexts which should themselves be the target of public health interventions; in other words, the "risks of risk factors" must be determined and assessed. Second, in contrast to researchers who argue that social conditions are

[5] http://www.rwjf.org/content/dam/farm/toolkits/toolkits/2006/rwjf55029 (Last Assessed 02/11/2015)

mere 'starting points' of or 'proxies' for true determinants of health, Link and Phelan contend that social conditions are "fundamental" causes of disease. As they explain:

> "For the purposes of this paper, we define social conditions as factors that involve a person's relationships to other people. These include everything from relationships with intimates to positions occupied within the social and economic structures of society. …We call them "fundamental" causes because…the health effects of causes of this sort cannot be eliminated by addressing the mechanisms that appear to link them to disease." (1995:81, 85-86)

Specifically, Link and Phelan argue that persons of higher socioeconomic status are better able to utilize their resources—both material (e.g., money) and social (e.g., social support)—to become aware of and avoid risk factors for disease regardless of type. As a result, persons without or with fewer of these resources are consistently vulnerable to diminished health outcomes even as more proximate (i.e. biological, epidemiological) factors fluctuate. Link and Phelan warn that inattention to the distribution of social and economic resources in a society can undermine interventions designed to promote health benefits, and cognizant of this concern, *The Pathways Program* targets this problem via its child care, child support, education/GED, employment, housing, transportation, and income support pathways.

In response to the flurry of research papers published in the wake of Link and Phelan's (1995) work regularly linking health outcomes to societal structures (see Phelan, Link, and Tehranifar 2010 for a review), the World Health Organization (WHO) established the Commission on Social Determinants of Health in 2005 in order to gather evidence for and facilitate action on these determinants. The Commission's report, *Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health* (Marmot et al. 2008), proposes a comprehensive framework for understanding and acting upon social and economic health factors. The report details the vast and largely avoidable inequities in health within and between counties around the world. It explains how these inequities result from the social conditions in which people grow, live, work, age, and seek health care, as well as how these conditions are in turn influenced by social, political, and economic forces. Its authors argue that in order to ameliorate the inequities caused by these conditions, civil society members, local and state governments, and multilateral agencies around the globe must collaborate in seeking inter-sector coherence in policy-making and action toward three goals: (1) the improvement of daily living conditions; (2) the attenuation of unequal distribution of power, money, and resources; and (3) the measurement of the problem and assessment of action regarding it. Beyond the pathways mentioned earlier in this section, *The Pathways Program* provides solutions for Marmot et al.'s (2008) first goal of improving daily living conditions via its domestic violence, food security, heat and utilities, homelessness prevention, legal services, disability income/appeal, and driver's license/I.D. pathways.

In the United States, the deleterious health effects of unfavorable social conditions are aggravated because they occur in the context a health care system characterized by fragmentation and poor functioning at key points (e.g. the proliferation of complex and regionally focused health organization networks; the inconsistent quality of care provided for women, racial/ethnic minorities, and the elderly; and the juxtaposition of over- and under-utilization of care unique to the American health care system; Rosich and Hankin 2010). Indeed, the U.S. Department of Health and Human Services' Healthy People program includes *health and health care* among its five dimensions of social determinants of health, along with *economic stability*, *education*, *social and community context*, and *neighborhood and built environment* [Healthy People 2020 n.d. (a)]. It also includes *access to health services* as a 2020 objective in its own right [Healthy People 2020 n.d. (b)]. Nolte and Pitchforth (2014) note that integrated care approaches which "bring together a range of professionals and skills from both the cure (health-care) and care (long-term and social-care) sectors" (2014:1) have been associated with improved care, health, and satisfaction for patients; and the Blue Cross Blue Shield of Massachusetts Foundation found in its assessment of public health interventions that many can provide substantial health benefits and reduce health care costs either on their own or in partnership with health care services (Taylor et al. 2015). As such, *The Pathways Program* boosts its participants' access to health services via its behavioral health, pharmacy/medications, substance use/abuse, and vision and hearing pathways.

Finally, access to health care services is especially important with respect to the availability of adequate preventive care over the life course. Healthy People 2020 [n.d. (b)] highlights the importance of having a primary care provider as a regular source of care and access to evidence-based preventive services for improving and maintaining one's health over time. The national program also emphasizes how socioeconomic resources and conditions are key to preventive care in another respect: preparation for and recovery from a major health-related incident, such as a disease outbreak or natural disaster [Health People 2020 n.d. (c)]. Ensuring adequate health insurance coverage is equally important to this outcome: Healthy People 2020 [n.d. (b)] lists insufficient coverage as a major barrier to accessing health services, along with lack of availability and high cost. Additionally, investigators of the 2014 Oregon Health Insurance Experiment, a randomized controlled trial in which researchers made use of natural experimental conditions created by the initiation of the state government's Oregon Health Plan Standard program, found that persons who received public health insurance (Medicaid) were more likely to make use of hospital or emergency department services, less likely to have unpaid medical bills, less likely to spend a "catastrophic" amount in out-of-pocket expenditure on medical payments (defined as greater than 30% of one's household income), and reported lower rates of depression and improved self-rated health compared a to control group of uninsured persons over one year's time (Mehra 2014). Accordingly, *The Pathways Program* expands participants' access to preventive care via its medical debt, health care home, and dental care pathways.

5. Data and Analysis

5.1. Data

UNMH Hospital group charge data was received from UNMH and consisted of all client visits and charges from January 2007 through December 2013. This includes information from the UNMH inpatient hospital, emergency room, urgent care, outpatient primary care clinics specialty care visits (e.g. gynecology, pain management, neurosurgery, newborn, etc.). The data set included the following information:

- Demographics - age, gender, race / ethnicity
- Service details – Date of service or admission, service provider, primary diagnosis, primary payer category, charge amount, and client's zip code.

These data do not include charge data from the UNMH medical group, First Choice or First Nations. Out of 2,239 Pathways clients, 1,417 (63.3%) with charges and visits records were identified from the hospital charge data. The Pathways clients in the charge data had 22,871 total visits. It should be noted that since the Pathways program officially started in Sep 2009, we exclude all charges and visits before the Pathways start date in the analysis. A total of 125 Pathways clients corresponding to 6,717 visits were therefore deleted, leaving 1,292 Pathways clients. Note: During this same time period, 830 Pathways clients were enrolled in the Health Care Home pathway.

Table 3 below provides a frequency of client visits by selected type of care, for Pathways and non-Pathways clients. Care type was categorized by the location of the visit[6].

[6] We thank Rodney McNease (UNM Hospital) for his guidance in categorizing the different hospital locations into type of care.

Table 3: Frequency table of visits

Location of Visit	Frequency	Percent (%)
Pathways Clients		
Emergency	2,083	12.91
Inpatient	19	0.12
Outpatient	3,593	22.28
Specialty Outpatient	10,101	62.63
Urgent Care	333	2.06
Non-Pathways Clients		
Emergency	282,200	8.55
Inpatient	4,425	0.13
Outpatient	777,184	23.54
Specialty Outpatient	2,118,077	64.14
Urgent Care	120,317	3.64

Note: Not all visit types are included in this table. Others include visits to OB, pharmacy. etc

Emergency room visits include visits to the emergency room department and pediatric emergency department. Outpatient category includes visits to the family practice clinic, flu shot clinic, pediatrics, etc. Specialty outpatient visits include the dermatology clinic, neurosurgery, cancer center, cardiology clinic, etc. Urgent care includes visits to the urgent care clinic, pediatric urgent care and Rio Rancho rapid care. Detailed information on each category is provided in Appendix Table I.

5.2. Estimation Technique

To evaluate the impact of Pathways, a Propensity Score Matching (PSM) technique was used to establish matched cohorts. The PSM approach matches the pool of Pathways clients (treated cases) to non-Pathways clients (control cases) that are identical in their propensity to be selected to participate in Pathways. This propensity of being selected is regarded as the propensity score. The propensity score predicts the probability of the individual being chosen to participate in

Pathways as a function of some covariates[7]. The propensity score can also be described as an individual prediction of whether the individual would have been selected to participate in the Pathways program. Each matching step is explained below.

Step 1

The first step was to select the potential matching confounders or covariates. These are gender, age, race/ethnicity, zip code, payer category, selected chronic/recurrent disease diagnosis, selected acute illness diagnosis and selected normal pregnancy diagnosis. Zip code and payer categories varied for each individual across the time period of study. For both Pathways and no-Pathways clients, each individual's frequently reported zip code and payer codes were chosen for the matching process. The chronic/recurrent disease comorbidities assessed are alcohol dependency, angina, asthma, chronic airway obstruction, chronic kidney disease, chronic heart failure, depressive disorder, diabetes, drug dependence, epilepsy and hypertension. The acute comorbidities assessed are acute bronchitis, kidney/urinary infection and pneumonia. It should be added that these covariates was selected based on data available in the UNMH charge dataset. Pregnancy diagnoses are also included. Table 4 below lists the corresponding ICD-9 codes for the selected diagnoses[8].

[7] Recall that participation in Pathways is based on the respondent's risk score instrument. Given the non-randomization of Pathways clients, calculating the propensity score creates a quasi-random scenario with the assumption that for individuals with the same propensity score, some were randomly selected to participate in Pathways.

[8] We thank Bill Wiese for his guidance in selecting the chronic, acute and pregnancy diagnosis categories

Table 4: List of ICD-9 codes for selected diagnoses

Diagnosis	ICD-9 code
Chronic/Recurrent	
Alcohol dependency	303.00, 303.90, 303.91
Angina	413.9
Asthma	493.22,493.90, 493.91, 493.92
Chronic airway obstruction	496
Chronic kidney disease	585, 585.3, 585.4,585.5, 585.6, 585.9
Chronic Heart Failure	428.0, 428.20, 428.22, 428.32, 428.33, 428.9
Depressive disorder	311
Diabetes	250, 250.01, 250.02, 250.03, 250.12, 250.13, 250.40, 250.42, 250.50, 250.51, 250.60, 250.62, 250.7, 250.72, 250.80, 250.82, 250.83
Drug dependence	304.00, 304.01, 304.03, 304.10, 304.20, 204.23, 304.30, 304.31, 304.40, 304.41, 304.43, 304.80, 304.81, 304.90
Epilepsy, Generalized	345.00, 345.01, 345.10, 345.11
Hypertension	401.0, 401.1, 401.9
Acute	
Acute bronchitis	466.0
Kidney/urinary infection	590.10, 590.80
Pneumonia	486
Pregnancy	
Pregnancy (normal)	V22.0, V22.1

The propensity score is estimated within the framework of a multivariate logistic regression. The logistic regression examines the impact of the covariates on the likelihood of being selected to participate in Pathways. Next, based on these confounders, we generated the propensity score that summarizes the relationship between the probability of being selected to participate in Pathways and the confounding factors (or covariates). This implies that individuals with similar propensity scores share similar distributions of the covariates.

Step 2

The next step was matching the Pathways clients (treatment group) to non-Pathways clients (comparison or control group) with similar propensity scores. The core idea of the matching process is to create a new sample of cases that share a similar (or approximately similar) likelihood of being assigned to the Pathways program. A variety of matching techniques can be used for matching. These include the nearest neighbor matching, caliper matching, stratification matching, Kernel matching and Weighing (Becker and Ichino, 2002, Caliendo and Kopeinig, 2005, Guo and Fraser, 2010). In the nearest matching, a non-Pathways client is chosen as a matching partner for a Pathways client with the closest propensity score. Nearest neighbor matching can be done with replacement (where a non-Pathways client can be used more than once as a match) or without replacement (where a non-Pathways client can only be used once). We use the nearest matching with replacement technique.

Another approach is to use the matching without replacement. The nearest-neighbor matching without replacement, on the other hand, will also match a Pathways client to the nearest available non-client in terms of their propensity scores. However, Non-Pathway clients that have been matched will no longer be available for another match thus the best match for a Pathways client given the propensity score may no longer be available. The matching with replacement is a preferable method because it minimizes bias and also minimizes the distance in propensity scores between Pathways clients and non-Pathways clients in each match and for all matches (Baumler, M at al. 2012). With-replacement matches usually have a higher quality of marching and reduced bias compared with non-replacement matches (Caliendo and Kopeinig, 2005)

In this analysis, a ten to one matching is used such that each Pathways observation is matched with ten nearest neighbors with the closest propensity score.

Step 3

After matching the samples, the effect of the program on the primary outcomes of interest are estimated. The primary outcomes measured are the total UNM hospital group charges and total number of visits. Results are presented in the next section. The control group matched with the treatment groups serves as the proxy for estimating the counterfactual outcome, that is, what would have happened to the treatment group in the absence of the Pathways program. The estimated effect of Pathways is therefore the difference in the outcomes for the treatment group and the control group.

It is crucial to note that because a treatment individual is matched with ten nearest neighbors, the matching/sample weight of each individual in the control group (sample weight = 0.1) is taken into consideration when calculating total outcomes.

6. Estimated Effects of Pathways

6.1. Average Outcomes for entire sample.

Table 5 presents the average charges and average number of visits for the overall sample of the treatment and control groups. As illustrated below, results from the propensity matching analysis indicate a positive effect of the Pathways program on UNMH hospital group charges. Specifically, the Pathways program reduced average charges over the time period of analysis by $57 (0.3%). However, a negative but small effect of the Pathways program on the total number of visits is also observed. Specifically, the average number of visits was increased by .79 (6.4%) as a result of the Pathways program.

Table 5: Average Charges and Average Number of Visits

Outcome Variable	Treated	Control	Average Treatment Effect	Percent Change
Number	1,187	11,270		
Hospital Charges				
• Average Charges	$19,256	$19,313	-$57.00	-0.30%
Visits				
• Average Number of Visits	12.34	11.55	0.79	6.40%

6.2. Total Outcomes for entire sample.

Table 6 presents the results for the total number of charges and total number of visits for the overall sample of the treatment and control group. As with the results with the average charges and average number of visits, results also show a 0.3% reduction in total charges and 6.5% increase in total visits as a result of the program. Specifically, the Pathways program reduced total UNM hospital group charges by $67,298 but the total number of visits was increased by 945 visits.

Table 6: Total Charges and Total Number of Visits

Outcome Variable	Treated	Control	Difference	Percent Change
Number	1,187	11,270		
UNMH Hospital Group Charges				
• Total Charges	$ 22,856,715	$ 22,924,013	-$67,298	-0.29%
Visits				
• Total Visits	14,653	13,708	945	6.45%

Note: Number of Treatment group = 1,187, Number in Control Group = 11,270. Total visits are approximated to the nearest whole number. Because a treatment individual is matched with ten nearest neighbors, the matching/sample weight of each individual in the control group (sample weight = 0.1) is taken into consideration when calculating total charges.

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6.3. Total Outcomes with program cost

Table 6 above presented the propensity score matching results of the total number of charges and total number of visits for both treatment and control groups. As shown above, a positive impact of the Pathways program on the UNMH hospital group charges were found but the program also resulted in an increase in total hospital visits by Pathways clients.

Table 7 below estimates the impact of the Pathways program on the total hospital charges taking into consideration the cost of implementing the Pathways program. As earlier noted, total estimated funding for the Pathways program was approximately $800,000 per budget year (from July 1 to June 30), total estimated program costs for the time period of analysis (Sep 2009 – Dec 2013) is therefore estimated as $3,486,072 for a total number of 2,239 Pathways clients[9]. This implies that after accounting for total program costs for the 1,187 Pathways participants in the treatment group, the total estimated charges for the treated increases to $24,704,850. The inclusion of this program cost therefore eliminates previous cost savings from the program as shown earlier in Table 6. Table 7 therefore shows an increase in total charges of $1,642,263 after including the program cost in the total charges.

[9] Actual program costs may differ from the estimated of $800, 000 due to inflation indexing.

Table 7: Total Charges with program costs

Outcome Variable	Treated	Control	Difference	Percent Change
Number	1,187	11,270		
UNMH Hospital Charges				
• Total Charges	$ 22,856,715	$ 22,924,013	-$67,298	-0.29%
• Program Cost	$1,848,135	$ 0	$1,848,135	
• New Total Charges	$ 24,704,850*	$ 22,924,013	$1,642,263	7.21%

Note: Number of Treatment group = 1,187, Number in Control Group = 11,270. Total visits are approximated to the nearest whole number. Because a treatment individual is matched with ten nearest neighbors, the matching/sample weight of each individual in the control group (sample weight = 0.1) is taken into consideration when calculating total charges.
*Total charges for treated includes the total cost of implementing the Pathways program for the 1,187 Pathways clients in the treatment group = $1,848,135.

6.4. Total Outcomes by gender and race/ethnicity.

Table 8 presents the number of charges and visits by gender and race/ethnicity. Comparison by gender revealed that the program resulted in a reduction in total charges for males by $171,992 (-2.65%). However, total visits for males were increased by 357 visits (10.9%). The program also resulted in an increase in both total charges and visits for females by $104,694 (0.64%) and 587 visits (5.2%) respectively.

Comparison by racial and ethnic groups indicated that Whites, Hispanics and Blacks Pathways clients all had a reduction in total charges (-1.5%, -0.6%, -90.6%). Native Americans however had an increase of 23.2% in total charges as a result of the program. For the total number of visits outcome, all racial and ethnic categories, with the exception of Hispanics had an increase in the total number of visits.

Table 8: Total Charges and Total Number of Visits by Gender, and Race/Ethnicity

Outcome Variable	Treated	Control	Difference	Percent Change
Male				
• Number	296	2,806		
• Total Charges	$ 6,495,955	$6,667,947	-$171,992	-2.65%
• Total Visits	3,279	2,922	357	10.89%
Female				
• Number	891	8,464		
• Total Charges	$16,360,760	$16,256,066	$104,694	0.64%
• Total Visits	11,374	10,787	587	5.16%
Whites				
• Number	204	1,838		
• Total Charges	$6,235,485	$6,328,359	-$92,874	-1.49%
• Total Visits	4,072	3,848	224	5.50%
Hispanics				
• Number	679	6,327		
• Total Charges	$13,849,202	$13,927,300	-$78,098	-0.56%
• Total Visits	9,122	9,223	-101	-1.11%
Native American				
• Number	128	1,309		
• Total Charges	$3,727,578	$2,863,484	$864,094	23.18%
• Total Visits	1,318	994	324	24.58%
Blacks				
• Number	39	407		
• Total Charges	$638,315	$1,216,598	-$578,283	-90.60%
• Total Visits	611	596	15	2.45%

Note: Total visits are approximated to the nearest whole number.

6.5. Total Outcomes by age categories.

Table 9 presents the number of charges and visits by age categories. We find that charges and visits decrease for participants in age group 51-60 (-25.2% and -13.8%) and for participants older than 61 years of age (-186.1% and -102.9%). However charges and visits increased for participants in all other age groups 18-24 (26.7% and 19.4%), 25-30 (33.9% and 25.9%), 31-35 (25.1% and 39.6%), 36-40 (52.9% and 42.9%) and 41-50 (32.7% and 30.2%).

Table 9: Total Charges and Total Number of Visits by Age category

Outcome Variable	Treated	Control	Difference	Percent Change
Age 18-24				
• Number	186	1,575		
• Total Charges	$2,540,528	$1,862,497	$678,031	26.69%
• Total Visits	1,863	1,501	362	19.43%
Age 25-30				
• Number	185	1,405		
• Total Charges	$2,864,255	$1,892,504	$971,751	33.93%
• Total Visits	2,218	1,643	575	25.92%
Age 31-35				
• Number	165	1,107		
• Total Charges	$2,030,272	$1,521,174	$509,098	25.08%
• Total Visits	1,869	1,129	740	39.59%
Age 36-40				
• Number	156	1,047		
• Total Charges	$2,698,966	$1,271,386	$1,427,580	52.89%
• Total Visits	1,693	966	727	42.94%
Age 41-50				
• Number	260	1,992		
• Total Charges	$6,200,906	$4,172,932	$2,027,974	32.70%
• Total Visits	3,232	2,255	977	30.23%
Age 51-60				
• Number	145	1,570		
• Total Charges	$4,035,282	$5,050,473	-$1,015,191	-25.16%
• Total Visits	2,245	2,555	-310	-13.81%
Age 61+				
• Number	59	1,414		
• Total Charges	$2,064,732	$5,907,265	-$3,842,533	-186.10%
• Total Visits	1,259	2,555	-1,296	-102.94%

Note: Total visits are approximated to the nearest whole number.

6.6. Total Outcomes by Type of Care

Table 10 presents the number of charges and visits by selected types of care, as categorized in. We found the program resulted in a decline in charges for outpatient (-13.4%) and specialty outpatient visits (-7.7%). However, total charges increased for emergency visits (54.8%) and urgent care (40.3%). In addition the program also resulted in a decline in outpatient visits (-6.4%), specialty outpatient visits (-6.2%) and urgent care visits (-6.7%), but a 42.0% increase was found for emergency care visits.

Table 10: Total Charges and Total Number of Visits by Type of Care

Care Type	Treated	Control	Difference	Percent Change
Emergency				
• Number	222	2,208		
• Total Charges	$2,837,954	$1,284,043	$1,553,911	54.75%
• Total Visits	1,151	668	483	41.96%
Inpatient				
• Number	0	4		
• Total Charges	$0	$1,401	-$1,401	--
• Total Visits	0	1	-1	--
Outpatient				
• Number	213	1,970		
• Total Charges	$2,874,311	$3,259,821	-$385,510	-13.41%
• Total Visits	2,734	2910	-176	-6.44%
Specialty Outpatient				
• Number	689	6,499		
• Total Charges	$16,963,056	$18,270,255	-$1,307,199	-7.71%
• Total Visits	10,560	9,907	653	6.18%
Urgent Care				
• Number	63	585		
• Total Charges	$181,394	$108,349	$73,045	40.27%
• Total Visits	208	222	-14	-6.73%

Note: Total visits are approximated to the nearest whole number.

6.7. Total Outcomes by Diagnosis

In Table 11, we report the total charges and visits by the selected chronic disease, acute disease and pregnancy diagnoses as specified in Table 3. Charges and visits increased for individuals who reported any of the selected chronic disease (11.0% and 1.9%) and pregnancy diagnoses categories (27.0% and 12.6%). However, a decrease in both total charges and visits (-12.8% and -15.6%) was found for the acute disease category.

Table 11: Total Charges and Total Number of Visits by Diagnosis

Whether the individual reported any of the selected diagnoses	Treated	Control	Difference	Percent Change
Chronic disease				
• Number	295	2,590		
• Total Charges	$12,607,755	$11,223,553	$1,384,202	10.98%
• Total Visits	7,044	6,914	130	1.85%
Acute disease				
• Number	44	403		
• Total Charges	$2,334,661	$2,634,119	-$299,458	-12.83%
• Total Visits	1,157	1,338	-181	-15.64%
Pregnancy diagnosis				
• Number	125	991		
• Total Charges	$2,904,178	$2,119,357	$784,821	27.02%
• Total Visits	2,914	2,548	366	12.56%

Note: Total visits are approximated to the nearest whole number.

6.8. Total Outcomes by Payment type

In Table 12, we report the total charges and visits by payment type categories – self-pay, Medicaid, Medicare, private insurance and UNM care. Participants with Self-pay and Medicare payment types all had a reduction in total charges and total visits as a result of the program. Total charges decreased by 3.7% under the self-pay payment type and 11.2% for the Medicare payment category. Similarly, total visits decreased by 1.8% under the self-pay payment type and 7% for the Medicare payment category.

Medicaid and private insurance payment types all had an increase in total charges and total visits as a result of the program. Total charges increased by 13.4% under the Medicaid payment type, 46.15% for self-pay payment type and 3.1% for the UNM care payment care category. Similarly, total visits increased by 16.5% under Medicaid and 34.6% for private insurance payment type.

Table 12: Total Charges and Total Number by Payment type

Payment type	Treated	Control	Difference	Percent Change
Self-Pay				
• Number	459	4,099		
• Total Charges	$12,820,977	$13,300,963	-$479,986	-3.74%
• Total Visits	8,533	8,682	-149	-1.75%
Medicaid				
• Number	432	3,675		
• Total Charges	$12,305,780	$10,659,071	$1,646,709	13.38%
• Total Visits	8,361	6,979	1,382	16.53%
Medicare				
• Number	265	2,416		
• Total Charges	$8,768,683	$9,749,322	-$980,639	-11.18%
• Total Visits	5,193	5,556	-363	-6.99%
Private Insurance*				
• Number	74	688		
• Total Charges	$3,941,868	$2,123,883	$1,817,985	46.12%
• Total Visits	2,230	1,459	771	34.57%
UNM care				
• Number	348	3,063		
• Total Charges	$10,845,488	$10,512,870	$332,618	3.07%
• Total Visits	6,107	6,362	-255	-4.18%

Note: Total visits are approximated to the nearest whole number. *Private insurance includes employer-provided insurance

7. Conclusion

Overall, the propensity matching analysis shows the Pathways program reduced total UNM hospital group charges. Specifically, the Pathways program reduced total charges by $67,298. However, an opposite effect is observed after taking into consideration the total estimated program cost of implementing the program ($1,848,135), therefore indicating a negative impact of the program on total charges (both hospital charges and program costs).

In addition, the Pathways program also increased total hospital visits by 945 visits. This increase in hospital visits suggests the Pathways program created a pathways or access to services that were not previously available for the Pathways clients before program enrollment, especially for clients between ages 18 – 50 and also for emergency and specialty outpatient type of cares. Nolte and Pitchforth (2014) note that evidence on utilization outcomes among participants in integrated care approaches tends to be mixed, in part because of a lack of a common metric; but they also suggest that such approaches may be improving health by increasing utilization. For example,

Shepperd et al. (2008) found in their assessment of 'hospital at home' services a non-significant increase in hospital admissions but also a significant decrease in mortality among intervention participants after six months' time. Hispanics, Whites, Native Americans and Black clients also increased their frequency of hospital visits.

Moreover, as the title of Marmot et al.'s (2008) report *Closing the Gap in a Generation* suggests, it would be an equivalent disservice to not account for the savings accrued by Pathways clients over a time period longer than the study's seven-year duration. Marmot et al. maintain that the narrowing of health inequities is a "long-term agenda" requiring "changes starting at the beginning of life and acting through the whole life course" (2008:23), a period of evaluation which is not feasible for *The Pathways Program*. Until we are able to measure how the program's pathways help guard participants against poor health outcomes even as more proximate causes of disease evolve over time (Link and Phelan 1995), assessments of the program's cost-effectiveness will be limited.

Appendix – Table I

Care Type	Components
Outpatient	Family Practice Clinic, West Side Clinic, NE Hgts Academy, Sandia Pueblo Clinic, Flu Shot Clinic, Employee Health, Flu Symptoms Clinic, Primary Care at Alamo, School Based Clinic, Gen Med Clinic, Walk-In Clinic, Medicine Faculty Clinic, Other Med Clinic, Family Practice, SW Mesa Clinic, Managed Care Clinic, Univ Ophthalmology Clinic, SE Hgts Clinic, Laboratory, Gen Peds Clinic, Young Childrens, Medicine, Pediatrics, Pharmacy, M+I Primary Care, Family Practice at MF&P, UNIV Prim Care, Atrisco Heritage CLN, UNM Lobocare Clinic, UNM Sandoval Primary Care UNMMG, First Choice-Non UH Location UNMMG, Para Los Ninos-Non UH Location UNM, Center for Life UNMMG
Specialty Outpatient	Reproductive Health Clinic, Audiology Hearing Aids, Ans. Pain Mgmt, Audiology Hearing Aids, Westside Allergy Clinic, Dermatology Clinic, Neurology Clinic, Dermatology MOHS Clinic, Neurosurg Clinic, Peds Neuroscience Clinic, NEH ENT Allergy, Infectious Disease, MD+MS Clinic, Multiple Sclerosis Clinic, NEH ENT Clinic, NEH Peds Allergy, Cancer Center, CRTC, Cardiac Cath Lab, Clin'l Research, Heart Station, CASAA (MHC), CRTC Las Cruces, CRTC-Las Cruces, CRTC Downtown, CRTC Farmington, Cancer Center Oncology, CRTC Radiation Oncology, CRTC Santa Fe, CRTC Women's Health, Cancer Center Downtown Oncology, CPH Community Family Team, Children's Heart Outreach, CPH Home Svcs, CPH School Svcs, CRC (OUTPT), CTH Ortho Clinic, Carrie Tingley Orthopedic Clinic, CTH Peds Clinic, Carrie Tingley Pediatric Clinic, CTH Off-Site Clinic, Carrie Tingley Off-Site Clinics, CTH Peds, CTH Ortho, Carrie Tingley Outpatient Rehab, Psych Faculty, Allergy Clinic, Cardiology Clinic, Coumadin Clinic, Diabetes Clinic, Endocrine Clinic, Gastroent Clinic, Observation Clinic, Hematology/Onc, Nephrology Clinic, Pulmonary Clinic, Rheumatology Clinic, Athletics Clinic, Cardiothoracic Clinic, Diabetes Care Center, OSIS Day Surgery, Developmental Disability Waiver, Dialysis, Cardiology Clinic Off-Site, Endoscopy Clinic, Pulmonary Hyper Clnc, Senior Health, Emergency Dept Care 1, Fixed-Wing Transport, Opthalmol Clinic, MLK Endoscopy Department, GI Studies/Endo, Gen Ortho Clinic, Ortho Interventional Rad Clinic, Sports Clinic, Ortho Faculty Clinic, Podiatry Clinic, Gynecology, Burn Clinic (BRN), Helicopter Transport, Home Health Care, Hospice Care, Interventional Radiology, Patient Education, Pediatric Infusion, Interventional Radiology Clinic, Pain Mgmt Clinic, Gen Surg Clinic, Ent Clinic, Periph Vasc Clinic, Thoracic Clinic, Trauma

	Clinic, Urology/Ad Clinic, Surgery Clinic – Burn, Transplant Clinic, Plastic Surg Clinic, Post Transplant, Urology/Ped Clinic, Continuity Clinic, Ped Endocrine Clinic, Ped Gastroent Clinic, Ped Hematology, Ped Neuro Clinic, Ped Oncology Clinic, Ped Pulm Clinic, Ped Surg Clinic, Childrens Heart, Other Peds Clinic, Mhc Milagro, Med Rec Transcr, Multisystmthrpy, Newborn, Neurodiag Lab, Clinical Trials, Neurology, Neuro/Psych Tst, Neuro-Surgery, Obstetrics, CTH Orthotics Prosthetics, O-R/Day Surgery, Oncology, Peds O-R/Day Surg – Pavilion, Orthopedics, Pulmonary Svcs, Uh Psych Clinic, Newborn CL-NBN, Partial Hosp, Ped's Sleep Lab, Psychiatric, Rehab Services, Lactation Clinic, Milagro, M+I Family Plan, M+I Prenatal, Repro Endo Clinic, REI IVF Services, REI Andrology Svcs, Womens Faculty Clinic, L-D Triage, Whc Ultrasound, Gen OB Clinic, Breast Clinic, Gynecology Clinic, Mat+Fetal Med, ABQ Midwifery, Univ Perinatol, Univ Gynecology, Other Womens Clinic, Radiology, Other Ref Org, Rehab, Sleep Lab, Speech Therapy, Se Heights Echo, Swm Echo, Milagro Ob Psych, Surgery, Ctc Travel Clinic, Dental Ambulatory Surgery Center-U, Cardiology Clinic-UNMMG, Center for Delelopment Disability-, Infectious Disease (SOM), UNMMG Dental Clinic, UNM Vein Center UNMMG, Heart Hospital UNMMG, Downtown Neurosurgery Clinic-UNMMG, UNMMG Continuum of Care SOM Clinic, Reproductive Health UNMMG, Univ Phys Assoc, Vascular Lab
Inpatient	Mid Level – Inpatient, Mid Level Physch IP CPC, Mid Level Physch IP UPC, Carrie Tingley Inpatient Rehab
Urgent Care	Urgent Care Clinic, PED Urgent Care, Rio Rancho Rapid Care - UNMMG
Emergency	Emergency Dept, Pediatric Emergency Department

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