

Addressing health inequality
and housing needs

PATHWAYS

Hospital Admission
and Discharge Pilot Project
with Home for Good

Indicative Cost-Benefit Analysis

January 2015 – December 2016

Luke B Connelly, PhD and Angela M Maguire, PhD



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PATHWAYS Hospital Admission and Discharge Pilot Project for Homeless and Vulnerably-Housed People:

Indicative Cost-Benefit Analysis for the period January 2015—
December 2016

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Executive Summary

This report provides an Indicative Cost-Benefit Analysis (ICBA) for the *Pathways Hospital Admission and Discharge Pilot Project* for the 2-year period of operation, January 2015 to December 2016. The *Pathways* project is funded by the Queensland Department of Health, and delivered by Micah Projects Inc.'s Brisbane Homeless Service Collaborative (BHSC) in partnership with St Vincent's Private Hospital Brisbane. The overall goal of the *Pathways* project is to improve health and social outcomes for homeless and vulnerably-housed people with multiple morbidities and complex social needs. *Pathways* is a targeted, integrated model of care that provides person-centred admission and discharge planning, care coordination, direct nursing care, and housing assistance to referred patients at point-of-discharge from hospital. A range of positive outcomes have been achieved for patients and services throughout the 2-year period of operation: these are comprehensively detailed in Rayner and Westoby (2017). This report focuses on an economic evaluation of post-discharge reductions in acute care and emergency service utilization that have been achieved via the *Pathways* project (please see the Technical Appendix of this report for detailed computations).

Since the commencement of the project in December 2014, *Pathways* has received 240 hospital referrals. Of those referrals, 150 people were directly supported by *Pathways* for more than 30 days: this cohort is the focus of the economic evaluation. The remaining 90 people were provided targeted interventions and diverted within 30 days to more appropriate, community-based services. For the *Pathways* cohort (n=150), it is estimated that the project reduced emergency department presentations from 893 presentations to 215 presentations (76% reduction); inpatient admissions from 519 to 126 admissions (76% reduction); and ambulance transfers to hospital from 647 to 110 transfers (83% reduction).

The resulting cost reductions in acute care and emergency service utilization are computed using present value (\$2016) Queensland Efficient Price (QEP) data and Queensland Ambulance Service (QAS) average costs per transfer. Additionally, to account for the complex needs of the cohort targeted by *Pathways*, sensitivity analyses (employing three Average Weighted Activity Units; AWAUs) are used to compute inpatient cost savings. Finally, the three AWAUs are used to provide estimates of the benefit-cost ratios (BCRs) for the *Pathways* project.

The main finding is that the present value (\$2016) net benefits of the *Pathways* project are estimated to exceed its costs by **\$2.88m**. **Sensitivity analyses indicate that the net benefits of *Pathways* may be as great as \$3.62m**, assuming inpatient treatment for this cohort is likely to be more resource intensive. The BCRs indicate the return-on-investment is substantial: for every dollar spent on the *Pathways* project, acute care and emergency service expenditure is reduced by approximately \$5.96. When resource-intensity of inpatient use is modelled, the estimates suggest that *Pathways* may return as much as \$7.25 per dollar spent.

In summary, the benefits of the *Pathways* project greatly exceed its costs: it cost-effectively supports a vulnerable cohort of people with multiple morbidities and complex social needs, and high levels of acute care and emergency service utilization. The project is strategically aligned with current Queensland Department of Health priorities to reduce rates of unplanned readmissions, and to increase the responsiveness of ambulance services (Queensland Health, 2016a). The ICBA indicates that, if the *Pathways* project is discontinued, there is a substantial risk of increased emergency department, inpatient admission, and ambulance transfer utilization in the catchment it serves. Based on the results of the ICBA, our recommendation is that *Pathways* continue to be funded to improve health service delivery

and outcomes for this vulnerable patient population, and to increase health system efficiency and sustainability.

Technical Appendix

The costs of the *Pathways* project and its sources are described in Table 1. Costs incurred in 2015 are presented in 2016 dollars at the five per cent rate of inflation/discount.

Table 1: Present Value (\$2016) Costs of the *Pathways* Project and Sources of Funding

Source: Support Type	Costs in Constant (2016) Dollars by Year	
	2015	2016
Queensland Department of Health Grant to St Vincent's Private Hospital: <i>Project Support</i>	\$240,729	\$229,266
St Vincent's Private Hospital: <i>Additional Nursing Support</i>	\$383	\$25,979
Mercy Sisters: <i>Vehicle Leasing Cost</i>	\$5,250	\$5,000
Micah Projects: <i>Brisbane Homeless Service Collaboration</i> now known as Home for Good Co-ordinated Access and Referral Team (CART) (Housing assistance, Coordination and Administration)	\$32,318	\$20,421
Micah Projects: <i>Brokerage Services</i> (including medical equipment and aids, medications, crisis accommodation, furniture, housing set-up costs, forensic cleans, and so on.)	\$9,573	\$10,917
Total Pathways Support	\$288,253	\$291,583
TOTAL COST (January 2015 - December 2016)	\$579,836	

Source: Calculated from de-identified data supplied by Micah Projects (2017). For further details of these costs and their computation see Connelly (2016).

The cost data and service use volumes detailed in Rayner and Westoby (2017) have been used to update the Indicative Cost-Benefit Analysis (ICBA) reported by Connelly (2016). Service volumes were estimated by applying the Poisson panel regression estimates produced in Connelly (2016; estimated on 88 participants) to the full cohort of 150 participants over the 2-year period, January 2015 to December 2016. The results are reported in Table 2. We estimate that the *Pathways* project reduced this cohort's:

- Emergency department presentations from 893 to 215 presentations (76% reduction);
- Inpatient admissions from 519 to 126 admissions (76% reduction); and
- Ambulance transfers to hospital from 647 to 110 transfers (83% reduction).

Table 2: Estimated Per Capita Service Use, and Total Service Use, for Emergency Department Presentations, Inpatient Admissions and Ambulance Transfers to Hospital, With and Without the *Pathways* Project

Service Type	Estimated Per Capita Service Use		Estimated Total Service Use	
	Without <i>Pathways</i>	With <i>Pathways</i>	Without <i>Pathways</i>	With <i>Pathways</i>
Emergency Department Presentations	5.95	1.43	893	215
Inpatient Admissions	3.46	0.84	519	126
Ambulance Transfers to Hospital	4.31	0.73	647	110

Source: Estimated from de-identified data supplied by Micah Projects Inc. (2017), econometric results reported in Connolly (2016, Table 4), and patient service numbers reported in Rayner and Westoby (2017).

The estimated differences in service use for the full sample (n=150), with and without the *Pathways* project, were then estimated using the 2016-17 Queensland Efficient Price (QEP) of \$4,756 per Average Weighted Activity Unit (AWAU; Queensland Health, 2016b). The analysis is based on the assumption that inpatient admissions for this cohort are weighted at 1.0 AWAs and ED presentations are weighted at 0.40 AWAs. Note that a constant value of \$4,756 is applied across 2015 and 2016. This method is preferable to applying a simple inflation factor to produce constant (\$2016) price estimates, as changes in the QEP are more likely to represent health sector-specific inflation than other (e.g., consumer price index-derived) measures.¹ Queensland Ambulance Service (QAS) average costs per transfer were used for the reasons stated in Connolly (2016), and were inflated at the rate of five per cent, to create a present value estimate of \$554 per transfer.

Table 3 presents the ICBA results for 150 *Pathways* participants over the 2-year period of operation, January 2015 to December 2016. The present value cost of the *Pathways* project was estimated to be \$579,836. The prevented costs of emergency department presentations were estimated to be approximately \$1.29m, the prevented costs of inpatient admissions were estimated to be approximately \$1.87m, and the prevented costs of ambulance transfers were estimated to be approximately \$0.30m. It is estimated that the net present value of the *Pathways* project, over the 2-year investment horizon, is approximately \$2.88m. In other words, the present value benefits of the *Pathways* project exceed its present value costs by almost \$3m.

¹ Given the analytical period is only two calendar years, and the magnitude of the (net benefit) results that are derived here, this analytical makes no appreciable difference to the results.
 Pathways Hospital Admission and Discharge Pilot Project – Indicative Cost-Benefit Analysis for the period January 2015—December 2016

Connelly (2016) sets out the reasons that the application of an inpatient AWAU of 1.0 is likely to give rise to an underestimate of the true resource use associated with inpatient stays for this cohort of patients. Due to the probability that this cohort is, on average, likely to use inpatient resources more intensively than the general inpatient population, Connelly (2016) conducted sensitivity analyses based on assumptions that the appropriate AWAU to apply probably exceeds unity. In that analysis, he presented inpatient costs avoided, and ICBA estimates, that are based on assumptions of 1.0, 1.19 and 1.40 AWAUs per homeless or vulnerably-housed person, per inpatient care episode. Table 4 presents such a sensitivity analysis, in which AWAUs of 1.0, 1.19 and 1.40 are applied to inpatient episodes (only) for the *Pathways* cohort of 150 participants. The sensitivity analyses produce net present value benefits for the *Pathways* project of approximately \$2.88m, \$3.23m, and \$3.62m, respectively.

The final row of Table 4 presents estimates of the benefit-cost ratios (BCRs) for the *Pathways* project using the three assumed AWAUs per inpatient admission. In cost-benefit analysis (CBA), BCRs are sometimes used as summary measures of the value of projects, particularly when mutually exclusive investments are being considered. A BCR in excess of unity (1.00) indicates that the present value benefits of the investment exceed its present value costs. In the baseline scenario, where the AWAU is assumed to be 1.00, the BCR is 5.96; increasing to 6.57 at an assumed AWAU of 1.19; and to 7.25 when the AWAU is assumed to be 1.40 per inpatient. The interpretation of these BCRs is that savings in expenditure on acute care and emergency service utilization for the *Pathways* cohort of 150 participants are in the range of \$5.96 to \$7.25 for every dollar spent on the *Pathways* project.

Table 3: Indicative Cost-Benefit Analysis (ICBA) – Results for the *Pathways* Project (\$2016)

Service Type	Without <i>Pathways</i> (A)				With <i>Pathways</i> (B)				Cost Differences
	Services per Capita	Service Use Total	Cost per Service	Total Cost	Services per Capita	Service Use Total	Cost per Service	Total Cost	With and Without <i>Pathways</i> (B-A)
Emergency Department Presentations	5.95	893	\$1,902	\$1,697,892	1.43	215	\$1,902	\$408,065	-\$1,289,827
Inpatient Admissions	3.46	519	\$4,756	\$2,468,364	0.84	126	\$4,756	\$599,256	-\$1,869,108
Ambulance Transfers to Hospital	4.31	647	\$554	\$358,420	0.73	110	\$554	\$60,707	-\$297,713
Cost of <i>Pathways</i> Project				\$0				\$579,836	\$579,836
The estimated net benefit of the <i>Pathways</i> project (n=150) is \$2,876,812									-\$2,876,812

Source: Estimated from de-identified data supplied by Micah Projects Inc. (2017), econometric results on estimates of service use reported in Connelly (2016, Table 4), and the 2016-17 Queensland Efficient Price (QEP) for hospital services of \$4,756 per Average Weighted Activity Unit (AWAU).

- Notes:
- (i) Inpatient admissions are assumed to constitute 1.0 AWAs each.
 - (ii) Emergency department admissions are assumed to constitute 0.40 AWAs each.
 - (iii) The cost per ambulance transfer is based on the estimate reported in Connelly (2016), inflated to 2016 values at the five per cent rate of inflation/discount.
 - (iv) The reported totals have been rounded to nearest-dollar values.

Table 4: Indicative Cost-Benefit Analysis (ICBA) – Sensitivity Analyses for the *Pathways* Project

Assumed Number of <i>Pathways</i> Beneficiaries (Inpatient Services)	Inpatient Costs Avoided for Three AWAU Weight Assumptions			ICBA Net Benefits of <i>Pathways</i> for Three AWAU Weight Assumptions		
	Inpatient AWAU Weight=1.00	Inpatient AWAU Weight=1.19	Inpatient AWAU Weight=1.40	Inpatient AWAU Weight=1.00	Inpatient AWAU Weight=1.19	Inpatient AWAU Weight=1.40
Inpatient costs saved for 150 beneficiaries (n=150)	\$1,869,108.00	\$2,224,238.52	\$2,616,751.20	\$2,876,811.65	\$3,231,942.17	\$3,624,454.85
	Benefit-Cost Ratios			5.96	6.57	7.25

Source: As for Table 3.

Notes: The AWAU weights used in these calculations are based on assumptions that are explained in Connelly (2016).

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