Evaluation of Outcomes for People Nominated to the Integrated Services Program (ISP) Supplementary Report – Health care service usage and cost analysis

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Abbreviations

ABS	Australian Bureau of Statistics
ADHC	Ageing, Disability and Home Care
ATSI	Aboriginal and Torres Strait Islander
CALD	Culturally and Linguistically Diverse
CHeReL	Centre for Health Record Linkage (NSW Ministry of Health)
DRG	Diagnostic Related Group
ED	Emergency Department
FACS	Department of Family and Community Services
HASI	Housing and Accommodation Support Initiative
HREC	UNSW Human Research Ethics Committee
ISP	Integrated Services Program (the Program)
NDIS	National Disability Insurance Scheme
NSW	New South Wales
SPRC	Social Policy Research Centre

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Executive Summary

The Integrated Services Program (ISP) coordinates cross-agency support for adults who have multiple and complex support needs, often as a result of mental illness, intellectual disability, or drug and alcohol use. Funded by the New South Wales (NSW) Government, the ISP has operated in the Sydney metropolitan area since 2005. The Social Policy Research Centre (SPRC) at UNSW Sydney was commissioned to undertake a program evaluation in 2015 by the Program's lead agency, NSW Ageing, Disability and Home Care (ADHC), a division of the NSW Department of Family and Community Services (FACS). The evaluation report was published in December 2016 (Purcal et al., 2016).[1] As part of the evaluation, a supplementary data linkage was initiated to examine ISP-related health care service usage for ISP clients and a non-client comparison group. This report presents findings of the health care data linkage component of the evaluation. It is to be read in conjunction with the 2016 evaluation report.

The ISP evaluation report provided preliminary findings of positive health care-related outcomes for ISP clients, including positive initial indication of related health service usage. The evaluation findings were limited in its quantitative components as a result of small client sample sizes and lack of secondary data sources available during the evaluation period. The health care data linkage in this second report aims to further inform policy-makers about cost and operationally effective models of service provision for people with complex needs.

While the 2016 evaluation relied on self-reported or recorded program health data, the health care data linkage in this report provides extensions and benefits including:

- detailed health service records from multiple Ministry of Health datasets, including hospital, emergency department and non-admitted mental health ambulatory content

- data for consenting current and all former ISP clients (study group), as well as the identified non-client cohort (comparison group), and

- data about retrospective health service history for several years prior to entering the ISP or being nominated for the Program (in the case of non-clients), which provided comparative data before and after Program entry to examine health service trends and changes, for both the study and comparison groups.

The extended data linkage assessed ISP health care service usage and related costs compared to avoided costs to the service system if the ISP did not exist. The time series framework used for the analysis focused on two years prior to, and two years following entry or nomination to the ISP. Additional research budget would allow further analyses, for example extending the time series framework past ISP exit dates. However, this would be associated with increasing statistical uncertainty. Preliminary analysis indicates that the findings presented below are sustained over longer timeframes.

The data linkage found that overall health care usage for ISP clients declined substantially following entry to the ISP compared to the non-client comparison group including:

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[1] https://www.sprc.unsw.edu.au/research/projects/evaluation-of-outcomes-for-people-nominated-to-the-integrated-services-program/

Hospital admissions

- ISP clients had an increased number of inpatient admissions in the period prior to Program entry, reflecting unmanaged or escalating health episodes, followed by a substantial and sustained decline in the number of admissions in successive years once in the ISP.

- Over the same before and after timeframe, the non-client comparison group showed a relatively stable lower level of admissions, with a minor increase in the year prior to their nomination to the ISP, suggesting the circumstances leading to their nomination.

Admitted days in hospital

- In addition to the total number of hospital admissions, average admitted days per year per ISP client also escalated in the 12 months prior to entering the Program to 109.1 days, partially due to a small number of clients with long-stay admissions, statistically significantly different from the comparison group for the same period with average admitted days per year of 36.4 days.

- Following entry to the ISP, client average admitted days per year declined substantially in Year 1 to 78.5 days, with a sustained statistically significant further decline in Year 2 (post entry) to 14.8 days, to a level below and not statistically different to the comparison group.

Emergency department presentations

- Consistent with hospital admissions and admitted days per year, emergency department (ED) presentations showed a similar pattern of escalated events in the period prior to entry to the ISP, followed by a substantial decline following entry to the Program.

- ISP client average ED presentations per year increased in the 12 months prior to entry from 5.4 to 10.4, followed by a decline post entry to 7.8 in Year 1 and a further substantial decline in Year 2 to 5.9.

- Over the same period, comparison group average ED presentations per year increased from 5.2 to 6.5 prior to nomination, followed by a minor increase in Year 1 post nomination to 6.6 and a further increase in Year 2 to 7.3.

Mental health ambulatory service use

- The average number of non-admitted contacts per year for ISP clients was relatively stable prior to entering the Program, declining from 26.5 to 25.8, followed by a minor decline in Year 1 to 23.5 and an increase in Year 2 to 27.2. None of these changes were statistically significant.

- By comparison, over the same period the comparison group showed high variation in accessing community-based mental health services, with average contacts increasing significantly prior to nomination from 15.4 to 30.9, followed by a further substantial increase in Year 1 to 45.4 and a subsequent substantial fall in Year 2 to 33.9.

Health care service cost

- The findings above indicate reduced annual estimated health care cost post entry to the Program of $3.4 million including:

   o cost reduction for hospital admissions of around $1 million

   o further reduction for admitted hospital days of $2.3 million

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- o reduced ED presentations, producing cost avoided of $72,416.

- Estimated average health care cost avoided per client conservatively indicates a cost offset of $69,913, representing 26% of total ISP client cost.

- Combined with previously estimated corrective service cost avoided of $10,883 (4% of total program cost) (Purcal et al., 2016), the total cost offsets per ISP client conservatively account for $80,797 per client, representing 30% of the total Program cost per year.

In summary, the health care data linkage validates and builds on preliminary positive health care outcomes presented in the evaluation report. The linkage showed that the ISP results in lowering and stabilising client health care usage. It identified substantial and sustained declines in hospital admissions, inpatient days per year, and ED presentations post entry. This, in combination with avoided corrective services cost, represents an offset per ISP client of 30 per cent of the Program cost per year.

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1. Background

The New South Wales (NSW) Department of Family and Community Services, Ageing, Disability and Home Care (ADHC) commissioned the Social Policy Research Centre (SPRC) at UNSW Sydney to undertake an evaluation of the Integrated Services Program (ISP, the Program). ADHC has administered the ISP in partnership with Housing NSW and the NSW Ministry of Health since 2005. The ISP establishes coordinated cross-agency responses for adult clients who have multiple and complex needs including mental illness, personality disorder, intellectual disability, acquired brain injury, and/or drug and alcohol use. Clients exhibit behaviours which place themselves and/or others at significant risk of harm.

The SPRC evaluated the Program costs and outcomes achieved by ISP clients, and the evaluation findings were published in Purcal et al. (2016). The evaluation examined secondary data sources from program partner agencies including NSW Health, Corrective Services, the Public Guardian, Juvenile Justice, and NSW Housing and Community Services. ADHC obtained secondary linked data from Corrective Services for ISP clients. Outcome data from other partner agencies was not available at the time, and no secondary data was available for a comparison group of non-clients.

Therefore, the project developed specifications for a supplementary component to undertake data linkage of health care datasets for ISP clients as well as a comparison group. The Centre for Health Record Linkage (CHeReL) at the NSW Ministry of Health developed the data linkage for ISP clients and non-clients. SPRC received the health care linkage datasets in May 2017. The supplementary analysis assessed hospital inpatient, emergency department and mental health service usage before and after entry to the Program, and for a comparison group of non-clients who were nominated but did not enter the ISP. The findings are presented in this report, which is to be read in conjunction with the first report (Purcal et al., 2016).

There is growing evidence showing that people with intellectual disability and complex needs experience poorer physical and mental health than the general population and often have difficulty accessing health care services (Reppermund et al., 2017). With the increased investment in specialised programs, there has also been a growing interest in measuring the outcomes for service users, and costs and benefits to government and the community more widely.

This supplementary health care data linkage provides further details of ISP clients and new comparative details of non-client (comparison group) health care service usage, to determine avoided costs to the service system if the ISP did not exist. This contributes to the evaluation aim to examine the longer-term client outcomes achieved by the ISP and to inform policy-makers about cost and operationally effective models of service provision for people with complex needs. Although program funding is currently in transition to the federal government under the National Disability Insurance Scheme (NDIS), the related health care and wider service sector costs and offsets remain within the NSW state government sector.

2.   Methodology

This component of the evaluation provides a supplementary extension to the final report published in December 2016, which assessed outcomes of the ISP and found generally positive results. This component incorporates the ISP health care data linkage. The methodology described in this section is presented in context of the overarching evaluation methodology in the first report (Purcal et al., 2016).

The health care data linkage analysis provides several extensions and benefits to the core evaluation including:

- Detailed health service records from multiple Ministry of Health datasets:

    - admitted patient records, including psychiatric unit admissions

    - emergency department presentations

    - mental health ambulatory (non-admitted community services), and

    - mortality data identifying deaths in client and comparison groups

- Data for all consenting current and all former ISP clients (study group)

- Data for all identified non-clients (comparison group)

- Retrospective health service history for several years prior to entering the ISP or being nominated for the Program (in the case of non-clients)

- Comparative before and after Program entry data to support paired before and after health service trends and changes for both the study and comparison groups

- Detailed health service resource usage for estimation of health service cost including:

    - hospital admissions and lengths of stay

    - Diagnostic Related Group (DRG) estimated cost of health care procedures

    - emergency department attendances and outcomes

- Detailed health care data not dependent on self-reported content with small sample sizes and potential errors.

The detailed methodology is described in Appendix A.

Limitations

Although there were large datasets in the final health care linkage, the number of health care episodes per quarter before and after entry or nomination to the Program were relatively small in some cases. Additionally, the number of current ISP clients who provided consent for the linkage was limited. Larger ISP client and comparison group sample sizes may have supported additional significant findings.

The health care service analysis was also limited by the budgeted time available for the data linkage project. Therefore, the focus was on developing the core time series framework and examining health service patterns for the two years prior to and two years following ISP entry or nomination, where Program intervention was the predominant change. This two-year timeframe

focus is likely to understate ongoing health care benefits and service system cost offsets over following extended years (see 4.1 and Appendix C).

The project has produced core linked health care datasets that could be further developed to support additional analyses, for example to extend the time series framework across ISP exit dates and examine specifically the health service trends after exit from the Program. This work is however associated with increasing uncertainty and shrinking sample sizes that are likely to reflect characteristic variation of small numbers of ISP clients.

3. ISP client and non-client profiles

Among the 50 ISP clients in the health care data linkage study group, demographic details were available for 49 clients (Table 3.1). The baseline characteristics combined confirmed relatively similar profiles for the study and comparison groups across age, gender and diagnostic groups. Supplementary information is in Appendix B.

Table 3.1 Baseline characteristics of ISP study and comparison groups

Demographics	Study (n=50)		Control (n=42)		Total (n=92)		
	N	%	N	%	N	%	p-value
Gender							**0.992**
Female	19	38.0%	16	38.1%	35	38.0%	
Male	30	60.0%	25	59.5%	55	59.8%	
Unknown	1	2.0%	1	2.4%	2	2.2%	
Total	**50**	**100.0%**	**42**	**100.0%**	**92**	**100.0%**	
Age group							**0.455**
18 and under	5	10.0%	5	11.9%	10	10.9%	
19 to 24	5	10.0%	9	21.4%	14	15.2%	
25 to 34	16	32.0%	7	16.7%	23	25.0%	
35 to 44	13	26.0%	10	23.8%	23	25.0%	
45 to 54	8	16.0%	8	19.0%	16	17.4%	
55 to 64	2	4.0%	1	2.4%	3	3.3%	
65 and over	0	0.0%	1	2.4%	1	1.1%	
Unknown	1	2.0%	1	2.4%	2	2.2%	
Total	**50**	**100.0%**	**42**	**100.0%**	**92**	**100.0%**	
Aboriginal and Torres Strait Islander (ATSI)							**0.001**
No	29	58.0%	37	88.1%	66	71.7%	
Yes	4	8.0%	4	9.5%	8	8.7%	
Unknown	17	34.0%	1	2.4%	18	19.6%	
Total	**50**	**100.0%**	**42**	**100.0%**	**92**	**100.0%**	
Culturally and Linguistically Diverse (CALD)							**0.001**
No	20	40.0%	35	83.3%	55	59.8%	
Yes	13	26.0%	6	14.3%	19	20.7%	
Unknown	17	34.0%	1	2.4%	18	19.6%	
Total	**50**	**100.0%**	**42**	**100.0%**	**92**	**100.0%**	

Source: ISP client program data (n=50); ISP nomination data (n=42)

ISP clients characteristically had complex needs, generally with multiple diagnoses. The baseline diagnoses for the ISP client and comparison groups was similar across the major diagnostic groups, as well as the number of diagnoses (Table 3.2). The ISP client group had a higher proportion of the most common mental health diagnoses (n=27, 54.0%) compared to the comparison group (n=16, 38.1%). The other diagnostic groups were relatively similar across each cohort and were not significantly different at the 0.05 significance level (p=0.072).

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The proportions of the study and comparison group with high numbers of diagnoses were relatively similar, with a slightly higher proportion of the comparison group with five diagnoses (n=6, 15.4%) and slightly fewer with six diagnoses (n=2, 5.1%). Overall each group reflected high levels of complex need, and they were not significantly different (p=0.386).

Table 3.2 Baseline diagnoses of ISP study and comparison groups

Diagnoses	Study (n=50)		Control (n=42)		Total (n=92)		
	N	%	N	%	N	%	p-value
Major Diagnostic Group							0.072
Mental Diseases and Disorders	27	54.0%	16	38.1%	43	46.7%	
Nervous System	5	10.0%	7	16.7%	12	13.0%	
Unknown	4	8.0%	4	9.5%	8	8.7%	
Substance Use & Substance Induced Organic Mental Disorders	1	2.0%	6	14.3%	7	7.6%	
Digestive System	1	2.0%	4	9.5%	5	5.4%	
Injury, Poisoning and Toxic Effects of Drugs	4	8.0%	1	2.4%	5	5.4%	
Other	8	16.0%	4	9.5%	12	13.0%	
Total	**50**	**100.0%**	**42**	**100.0%**	**92**	**100.0%**	
Number of diagnoses							0.386
1	3	6.3%	1	2.6%	4	4.6%	
2	4	8.3%	5	12.8%	9	10.3%	
3	16	33.3%	15	38.5%	31	35.6%	
4	11	22.9%	8	20.5%	19	21.8%	
5	3	6.3%	6	15.4%	9	10.3%	
6	8	16.7%	2	5.1%	10	11.5%	
7 +	3	6.3%	2	5.1%	5	5.7%	
Total	**48**	**100.0%**	**39**	**100.0%**	**87**	**100.0%**	

Source: ISP client program data (n=50 –missing=1); ISP nomination data (n=42-missing=1)

The ISP was established in 2005 as a time-limited program to support clients for up to 18 months. In practice, many clients remained in the Program for longer periods. Most people in the health care data linkage study group had been in the Program for between 1–4 years. There were 19 longer-term clients (38%), who had been in the ISP for more than four years, and 11 of those had remained for six years or more (Figure 3.1). This reflects the longer time required to address some clients' multiple and complex needs, and limited options for transition to alternative support, even when their support needs have become stable (Purcal et al., 2016).

Of the 10 current clients (dark segments of bars), seven had been in the ISP for five years or longer, and all current clients had been in the Program for three years or more. The health care linkage study group included a larger sample of clients who had exited the Program, as well as a

minimum of two years since exiting, providing a post-exit sample of data linkage to examine whether the health care service usage levels during time in the Program were sustained.

Figure 3.1 Client length of time in the ISP
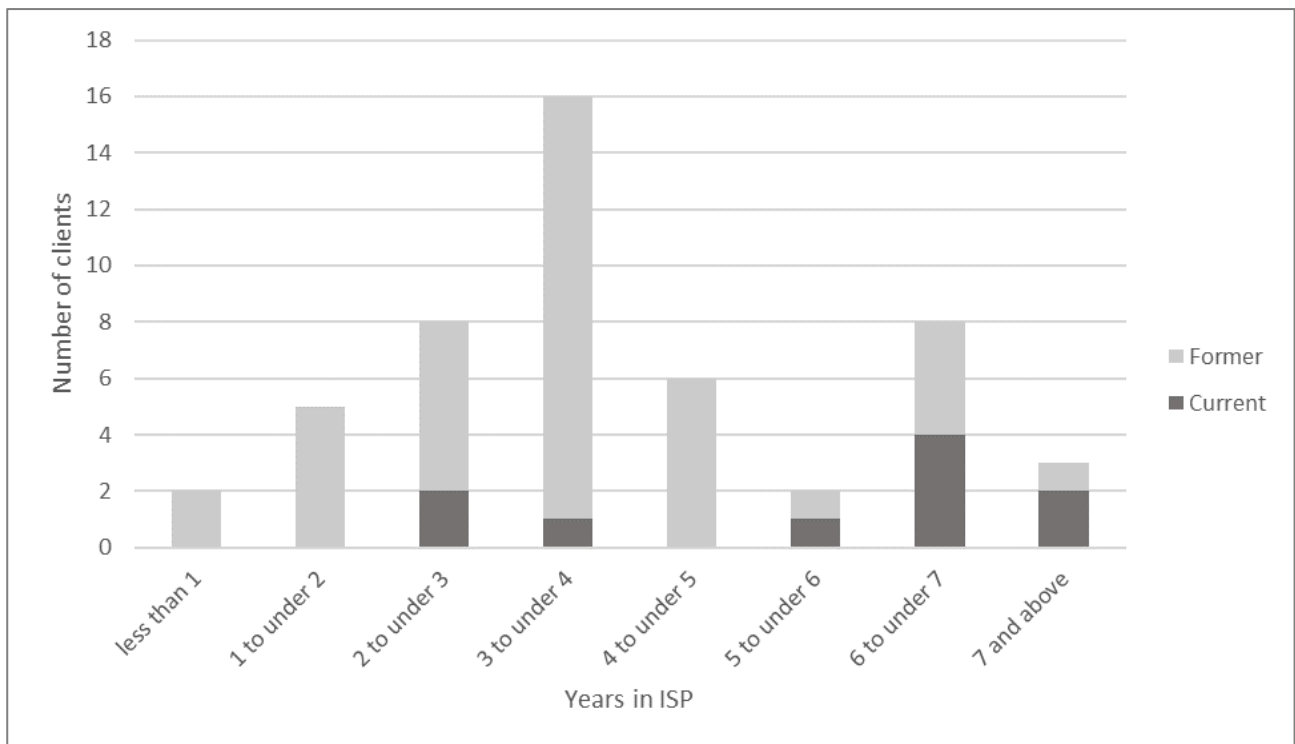
Source: ISP client program data (n=50), current clients (n=10), former clients (n=40)

In summary, the ISP client and comparison group profiles show:

- The ISP client and comparison groups reflect similar baseline profiles across demographic and diagnostic characteristics including age, gender, major diagnostic groups and the high numbers of multiple diagnoses per person. The study and comparison groups were not significantly different across any of these categories.

- More men (61%, n=30) than women were in the current ISP client group, with a similar higher proportion of men in the comparison group (62%, n=26).

- The average age of clients was 35 years (range 18–63 years), and 82 per cent were single.

- The number of Aboriginal and Torres Strait Islanders and people from culturally and linguistically diverse backgrounds in the study and comparison groups were based on small sample sizes but indicated proportions similar to the general population.

- On entering the ISP, 94 per cent of clients had multiple diagnoses, with the majority having three or more diagnoses per person, indicating the complexity of support needs. Similar high levels of multiple diagnoses were also reflected in the non-client comparison group.

- Although the ISP was established as a time-limited program to support clients for up to 18 months, clients stayed in the ISP for about three years on average. This reflects the longer time required to address some clients' multiple and complex needs, and limited options for transition to alternative support, even when their support needs have become stable.

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4. ISP client and non-client health care usage

This section reports on health care service usage of ISP client and non-client comparison groups. Each data source is presented in the following sections for admitted patient episodes, emergency department presentations, and non-admitted mental health ambulatory services.

4.1 Hospital inpatient services

This section presents the use of hospital inpatient services for ISP clients and the non-client comparison group. The figures present the change in number of admissions and length of stay, including comparison between groups as well as paired before and after changes within each of the client and control cohorts. The section also reports on the hospital admission episode of care types.

Hospital inpatient admissions

Overall, ISP clients show a trend in number of inpatient admissions, with increased episodes in the period prior to Program entry, reflecting unmanaged or escalating health episodes. Following entry to the ISP, clients showed a substantial and sustained decline in the number of admissions (Figure 4.1). Over the same timeframe, the paired before and after non-client comparison group remained relatively stable at a lower average level. The comparison group showed a minor increase in the year prior to their nomination to the ISP, suggesting the circumstances leading to their nomination.

Figure 4.1 Total hospital admissions per year
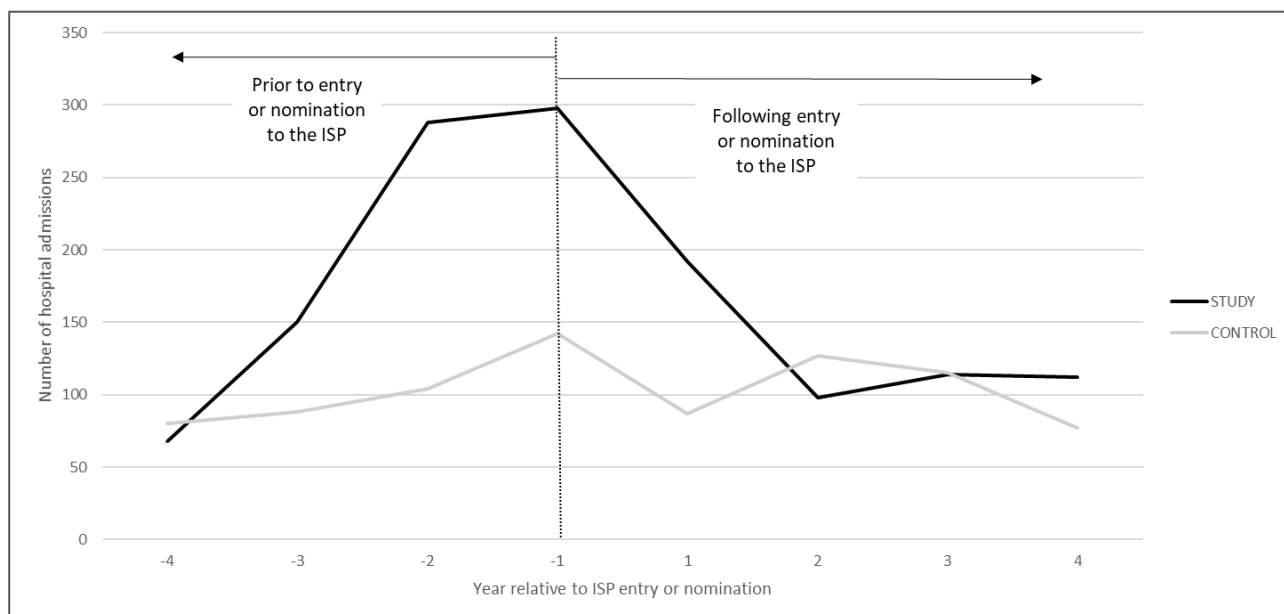
Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)

To examine the before and after trend, the average number of admissions per year were firstly compared for two years prior to and two years following entry or nomination to the Program (Table 4.1). The number of admissions is a summary initial indicator and does not reflect the often extended lengths of stay within each admission. The paired before and after study group presented an escalated annual average number of admissions in Year 2 prior to entry (6.1) and Year 1 prior to ISP entry (6.3). Over the same 2-year period prior to nomination, the comparison group had substantially lower average admissions of 2.8 in Year 2 and 3.8 in Year 1. Given the sample sizes

and relatively small number of high admission individuals, the changes were not statistically significantly different.

In the 12 months following entry to the ISP the client study group declined from an average of 6.3 to 4.1 admissions per person per year, while the comparison group decreased from a lower 3.8 to 2.4 admissions per person, again not a statistically significant change. At Year 2 following entry to the Program, the study group declined further from 4.1 to 2.1, which was below the comparison group average admissions of 3.4, therefore returning to a longer-term lower average level in line with the comparison group.

Table 4.1 Change in average inpatient admissions per year

Year	Matched clients	Year Prior	Year Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Y-2 to Y-1	47	6.1	6.3	0.2	7.0	-1.8	2.3	0.836
Y-1 to Y+1	47	6.3	4.1	-2.3	12.2	-5.8	1.3	0.213
Y+1 to Y+2	47	4.1	2.1	-2.0	7.3	-4.1	0.1	0.067
Comparison group								
Y-2 to Y-1	37	2.8	3.8	1.0	3.1	0.0	2.1	0.056
Y-1 to Y+1	37	3.8	2.4	-1.4	5.0	-3.1	0.2	0.078
Y+1 to Y+2	37	2.4	3.4	1.1	3.7	-0.1	2.3	0.083

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
n=84, study group n=47, comparison group n=37, paired t-test on matched before and after clients and non-clients

Overall the average admissions for the ISP study group reflect increased levels in Year 2 and Year 1 prior to entry to the Program, followed by decreases in successive years once in the Program, returning to a similar longer-term average level as the comparison group. The trajectory of decline in the client group occurred at a sustained rate over the two years with the Year 2 reduction approaching statistical significance (p=0.067). The average figures reflect the characteristically skewed distributions, with a small group of clients accounting for high numbers of admissions as seen in the relatively wide variation and 95% confidence intervals.

Due to limited available resources for the health care linkage project, statistical analysis focused on two years before and after entry or nomination to the ISP. Preliminary review of longer timeframe activity indicates that the reduced levels achieved at two years after entry to the Program were sustained over several years. This longer-term perspective is reflected in Figure 4.1 showing admissions over four years before and after ISP entry or nomination, and further examination of quarterly admission over six years prior to and six years following entry to the Program, provided for reference in Appendix C.

Hospital length of stay

Hospital admission to psychiatric units often involves extended lengths of stay, as reflected by several ISP clients in hospital for several months and in some cases years before transitioning to the ISP. In this context, further to the average number of admissions, the average number of inpatient days per year showed differences between the study and comparison groups.

In addition to the total number of hospital admissions being higher for ISP clients than the comparison group in the two years prior to entering the Program, the average length of stay per person was also higher for the ISP study group prior to entering the Program. In Year 2 prior to entry to the ISP, clients spent an average of 79.0 days as inpatients, compared to 24.6 days for the comparison group (p=0.008) (Table 4.2). This higher level of inpatient days increased further in the year prior to entry to 109.1 days, with a comparatively minor increase in the comparison group to 36.4 days, also statistically significantly different from the study group (p=0.003).

Following entry to the ISP, client average inpatient days per year declined in the first year to 78.5 and substantially in Year 2 to 14.8 to levels not significantly different from the comparison group (p=0.627). The admitted patient days per year were again characteristically skewed to a relatively small group of clients with long admissions, for several months and multiple years in some cases. The ISP provided support that enabled these long-stay admitted patients to transition to the Program from hospital.

Table 4.2 Change in average inpatient days per year

Year	Study group	Comparis on group	Diff	Standard error	95% CI Lower	Upper	p-value
Year 2 prior	79.0	24.6	54.4	19.9	14.8	94.0	0.008
Year 1 prior	109.1	36.4	72.7	122.4	25.0	120.3	0.003
Year 1 post	78.5	47.1	31.4	23.9	-16.1	78.9	0.192
Year 2 post	14.8	21.2	6.5	13.2	-20.0	32.9	0.627

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
n=84, study group n=48, comparison group n=36, independent sample t-test

In addition to the changes in average days each year between the study and comparison group, the longitudinal changes were also examined for paired figures for the same individuals across each year. The ISP study group increased significantly from 79.0 days in Year 2 prior to entry to the Program, to 109.1 days in Year 1 prior to entry (p=0.017), Table 4.3. The average number of admitted days declined to 78.5 in the first year following entry to the ISP (p=0.060) and declined again significantly in Year 2 to 14.8 days (p=0.001).

Table 4.3 Longitudinal change in average inpatient days per year

Year	Matched clients	Year Prior	Year Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Y-2 to Y-1	48	79.0	109.1	30.1	84.1	5.7	54.5	0.017
Y-1 to Y+1	48	109.1	78.5	-30.6	110.2	-62.6	1.4	0.060
Y+1 to Y+2	48	78.5	14.8	-63.8	119.0	-98.3	-29.2	0.001
Comparison group								
Y-2 to Y-1	36	24.6	36.4	11.9	57.9	-7.7	31.4	0.227
Y-1 to Y+1	36	36.4	47.1	10.7	110.2	-18.5	39.8	0.462
Y+1 to Y+2	36	47.1	21.2	-25.9	77.8	-52.2	0.4	0.054

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
n=84, study group n=48, comparison group n=36, paired t-test on before and after clients and non-clients

In contrast, the paired comparison group across each year increased the average inpatient days in Year 1 following ISP nomination to 47.1 days (p=0.462) and declined in Year 2 to 21.2 days (p=0.054), neither change was statistically significant from the prior year. Collectively these results confirm significant decline in hospital inpatient days for ISP clients following entry to the Program and when contrasted with the non-client comparison group.

Hospital admission episode of care types

Overall, hospital admission episode of care type was almost exclusively reported as Acute Care for both client (96.6%, n=862 episodes) and non-client comparison groups (94.0%, n=437 episodes). Of the remaining types of care, the study group included 12 hospital boarder episodes in the two years prior to ISP entry (2.0%, n=12), with no similar cases in the comparison group. A hospital boarder in NSW is a person who is receiving food and accommodation at the hospital but for whom the hospital does not accept responsibility for treatment and care. Hospital boarders are not admitted to the hospital but may be registered with a hospital.

Due to the small subgroup sample sizes these episodes are not statistically significant, but show a consistent direction of reduced episodes in line with total admissions, following entry to the Program. Small numbers of clients and non-clients had episodes of care for rehabilitation care, maintenance care and palliative care, but these were also not statistically significant.

4.2   Hospital emergency department presentations

Consistent with hospital admissions, the overall trend in emergency department (ED) presentations by ISP clients indicates a pattern of increased events in the 2-year period prior to Program entry, again suggesting unmanaged escalating health episodes. By comparison, the two years following entry to the Program consistently showed a substantial and sustained decline in the number of ED episodes. The change in frequency was particularly pronounced in the quarters immediately before and after entry into the ISP, as presented in Figure 4.2.

Over the same timeframe, the paired before and after non-client comparison group showed a minor increase in the two quarters prior to their nomination to the ISP, perhaps again revealing the circumstances leading to their nomination. Similar to hospital admissions, the comparison group showed a relatively lower and more stable longer-term trend over the 24 months prior to and following nomination.

To examine the before and after trend, the average number of ED presentations per year were compared for two years prior and two years following entry or nomination to the Program. Initial statistical tests examined the independent study and comparison group samples pre- and post-entry or nomination. The study group presented a higher annual average number of presentations in the year prior to ISP entry (10.4; n=48, CI 4.4 to 16.4) compared to the comparison group with an average of 6.5 per person per year (n=38, CI 3.7 to 9.3), a difference of 3.9 presentations per person. Given the sample sizes and small number of high frequency ED individuals, the average numbers of presentations were not statistically significantly different (p=0.630).

In the 12 months following entry to the ISP, the client study group declined from an average of 10.4 to 7.8 per person per year (n=48, CI 3.8 to 11.8), while the comparison group increased marginally from 6.5 per person to 6.6 (n=38, CI 3.2 to 9.8), again not statistically different (p=0.630). The difference reduced to 1.2 fewer average days in the comparison group, i.e. the study group stabilised closer to pre-ISP and comparison group levels.

Figure 4.2 Emergency department presentations per quarter
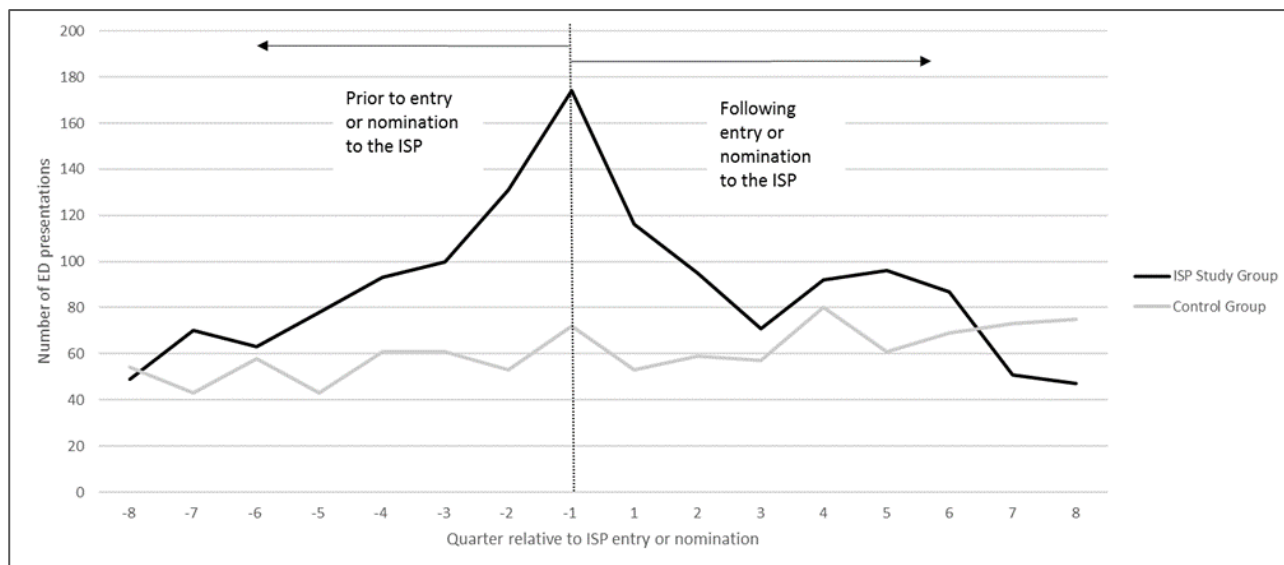
Source: ISP health care data linkage - NSW Emergency Department Data Collection (EDDC)
Paired before and after samples n=86, study group n=48, comparison group n=38

Additional statistical tests were undertaken across paired before and after samples of the same individuals to examine the longitudinal changes and better control for variation in baseline characteristics. In Year 2 prior to entry to the ISP, the client study group had an annual average number of ED presentations per person of 5.4 (n=48), representing a relatively similar level to the comparison group for the same period (5.2, n=38) (Table 4.4). For the ISP client study group, the average number of ED presentations increased in the year prior to entering the Program from 5.4 to 10.4, an increase of 5.0 per year (n=48, 95%CI -1.2 to 11.1).

In the year following entry to the Program, average ED presentations declined in the study group from 10.4 to 7.8, a decline of 2.6 (n=48, 95%CI -8.0 to 2.8), and declined again in the successive Year 2 following entry to 5.9, a further annual average reduction of 1.9 (n=48, 95%CI -0.1 to 4.0). Overall, the average ED presentations for the study group confirm an increase from a similar level to the comparison group in Year 2 prior to ISP entry, followed by successive decreases following entry to the ISP for two consecutive years, returning to a similar longer-term level to that of the comparison group.

In contrast, the comparison group average ED presentations show a lower and relatively stable level of activity, increasing slightly in the year prior to nomination from 5.2 to 6.5 and increasing slightly following nomination to 6.6 in Year 1 and again to 7.3 in Year 2. The comparison group changes over each year were not statistically significantly different.

The average figures reflect a skewed distribution with a small group of clients accounting for high numbers of ED visits, as seen in the relatively wide variation and 95% confidence intervals. For this reason, although the pattern of ED activity shows consistent direction in pre- and post-Program activity, the changes are not statistically significant at the 0.05 significance level.

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Table 4.4 Change in average number of ED presentations per year

Year	Matched clients	Year Prior	Year Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Y-2 to Y-1	48	5.4	10.4	5.0	21.2	-1.2	11.1	0.112
Y-1 to Y+1	48	10.4	7.8	-2.6	-18.5	-8.0	2.8	0.340
Y+1 to Y+2	48	7.8	5.9	-1.9	-7.1	-0.1	4.0	0.065
Comparison group								
Y-2 to Y-1	38	5.2	6.5	1.3	5.2	-0.4	3.0	0.138
Y-1 to Y+1	38	6.5	6.6	0.1	6.6	-2.2	2.1	0.961
Y+1 to Y+2	38	6.6	7.3	0.8	7.0	-1.5	3.1	0.506

Source: ISP health care data linkage - NSW Emergency Department Data Collection (EDDC)
n=86, study group n=48, comparison group n=38, paired t-test on before and after clients and non-clients

Context for number of ED presentations

The total number of ED presentations was the overarching measure, but other dimensions in the emergency department linked dataset provided details of the types, severity and frequency of presentations across the study and comparison groups, before and after entry or nomination to the ISP.

Referral source

Referral source to the ED provided supplementary details about the circumstances at the time of the presentation. The majority of episodes (around 65%) were reported as self, family or friend referred, with other sources including a range of community based services and general practitioners.

Referrals were also reported from prison or Justice Health, comprising 88 referrals in the two years prior to and after ISP entry or nomination (3.7% of total ED referrals). The majority of referrals occurred pre-ISP (71/88, 80.9%) with the majority of the pre-ISP episodes within the ISP client study group (n=59) compared to the comparison group (n=12). Notably, the reduction in referrals from prison and Justice Health after ISP entry or referral was predominantly due to reduced cases in the ISP client study group, reducing from 59 pre-ISP to 12 following entry to the Program (a decline of 47 cases, 79%), with the comparison group reducing by seven cases post nomination.

Consistent with service usage by ISP clients, the change in prison referrals was the result of a relatively small number of clients, with three clients accounting for 49 of the 59 pre-ISP cases. Of these three clients, two did not return to the ED at all during the two years after entering the Program, and the remaining highest referral client reduced to five cases in the year following entry, and then also did not have any ED referrals in the second year. This is consistent with the criminal justice findings in the evaluation report showing a significant reduction in days in custody following entry to the Program.

Visit type

Reported visit type was almost entirely recorded as standard ED presentations (n=2385, 97.8%). Separate from the reductions in ED presentations described below, the most significant change in other visit types was for unplanned return visits for continuing conditions. For the two years prior to ISP entry or nomination, the ISP client group recorded 30 unplanned returns (4.0%) versus six for the comparison group (1.4%). For the two years after entry to the ISP, the paired comparison for the before and after individuals declined to one for the study group (0.2%), with the comparison group remaining unchanged at six (1.1%). Due to the relatively small proportion of unplanned returns these results are not statistically significant but are consistently and predominantly due to reduced events in the ISP client study group following entry into the Program.

Mode of arrival

Arrivals by ambulance: Arriving to an ED by ambulance generally indicates increased urgency and seriousness of an event, in comparison to arriving by private vehicle, public transport or other non-emergency mode of arrival. Of the 2,385 ED presentations during the two years prior to and after ISP entry or nomination, almost half arrived by ambulance (n=1,139, 47.8%), with 25.6% arriving by private vehicle (n=610) and 17.6% arriving in a police or correctional services vehicle (n=420).

The arrival by ambulance presentations again reflect a substantial reduction in paired events for the ISP client study group before and after entry to the Program, falling from 332 arrivals (23.5% of total study group events) before entry to 275 (19.5% of total clients). In contrast, the comparison group increased the number and proportion of arrivals to ED by ambulance from 215 (22.1%) to 317 (32.6%) of total comparison group ambulance arrivals, indicating a substantial increase in the serious emergency incidents in the comparison group, while the ISP client group declined.

Arrivals by police or correctional service vehicles: The before and after ED presentations arriving by police or correctional service vehicles also indicated a substantial reduction in the paired before and after ISP client group sample from 198 in the 24 months prior to ISP entry (14.0% of total ISP client arrivals) to 85 (6.0%). This compares to the paired before and after study group, which declined slightly over the same period from 83 (8.5%) to 54 (5.6%).

This decline in study group contact with correctional services and Justice Health is consistent with the data received from correctional services showing that the ISP was associated with a substantial decline in prison events both on entry to the Program, and also continuing following exit (Purcal et al., 2016).

Mode of separation

On exit from the ED, the majority of cases were completed and individuals left the department (n=1,273, 53.4%). Of the cases that were admitted to a ward or inpatient unit, the paired before and after ISP client group reduced substantially from 118 (29.9% of total client ED presentations) to 78 in the two years after entry to the ISP (19.8%). In contrast, the paired comparison group admissions from ED increased following nomination to the ISP from 75 (28.0%) to 77 admissions in the two years after nomination (28.7%). This perhaps reflects the proportion of ISP clients who have earlier intervention and better management of conditions rather than allowing episodes to escalate where an unplanned admission through ED is necessary.

4.3 Non-admitted mental health ambulatory services

The NSW Mental Health Ambulatory Data Collection is dedicated to the assessment, treatment, rehabilitation or care of non-admitted patients. It may include mental health day programs, and psychiatric outpatient and outreach services (e.g. home visits). The assessment of services presented in this section focuses on client and non-client 'contacts', as opposed to 'episodes of care' by clinicians to a patient.

The average number of contacts was relatively stable for ISP clients at around 25 per year, with a slight increase to 27.2 in Year 2 following entry to the ISP (Figure 4.3). This may partially reflect the implicit objective of the Program, to assist clients to transition to accessing more community based mainstream services and reduce use of specialist services.

Figure 4.3 Average mental health ambulatory contacts per person per year
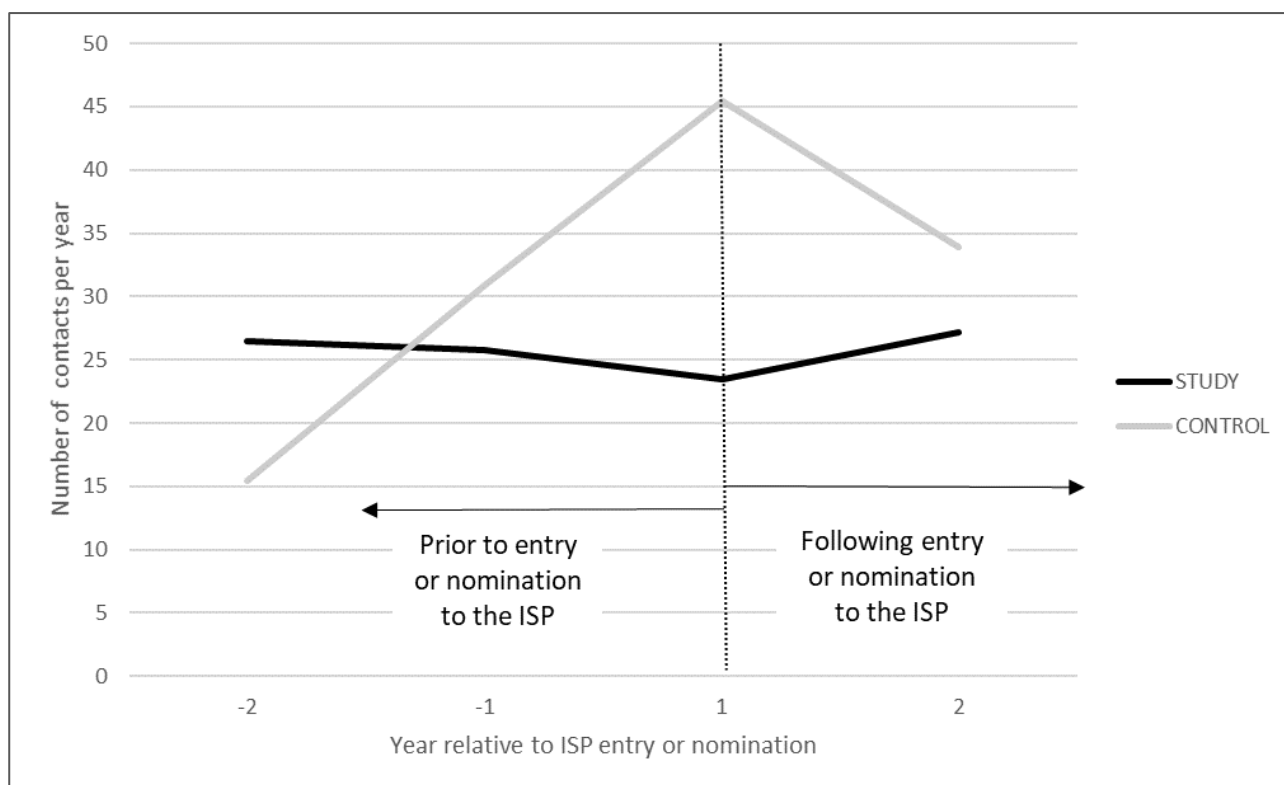
Source: ISP health care data linkage - NSW Mental Health Ambulatory Collection (MH-AMB)
n=82, study group n=47, comparison group n=35

The comparison group by contrast showed high variation in community based activity, doubling prior to nomination to the ISP from 15.4 contacts per year to 30.9 the year, and increasing substantially again in the year following nomination to 45.4 contacts per year. The comparison group variation reflects a small group of high contact individuals, as does the decline in Year 2 following nomination. As for study and comparison group samples across the health care linkage data, variation reflects highly skewed episodic activity. The relative stability of the ISP contacts may reflect program case planning, management and coordinated support.

The change in the average number of contacts per year reflected the high variation and skewed distributions and are generally not significantly different each year (Table 4.5). The study group indicated a slight decline in Year 1 following Program entry followed by an increase in Year 2 with neither change statistically significant. The slight variation each year for ISP clients indicated a relatively stable level of community based mental health service access.

In contrast, the comparison group showed substantially higher variation, particularly in the year leading up to ISP nomination, where the increase from 15.4 to 30.9 was statistically significant (p=0.036). Overall, the comparison group reflected high variation each year, including an increase in Year 1 following nomination followed by a decline in Year 2.

Table 4.5 Change in average number of non-admitted contacts per year

Year	Matched clients	Year Prior	Year Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Y-2 to Y-1	47	26.5	25.8	-0.7	29.3	-9.3	7.8	0.862
Y-1 to Y+1	47	25.8	23.5	-2.3	37.5	-13.3	8.8	0.683
Y+1 to Y+2	47	23.5	27.2	3.7	40.1	-8.1	15.4	0.534
Comparison group								
Y-2 to Y-1	35	15.4	30.9	15.5	41.9	1.1	29.9	0.036
Y-1 to Y+1	35	30.9	45.4	14.5	128.7	-29.7	58.7	0.509
Y+1 to Y+2	35	45.4	33.9	-11.4	55.1	-30.4	7.5	0.229

Source: ISP health care data linkage - NSW Mental Health Ambulatory Collection (MH-AMB)
n=82, study group n=47, comparison group n=35, paired t-test on before and after clients and non-clients

The datasets were examined across each available data element to assess the specific services that were driving the variation. Many of the service groupings were broad categories and did not reveal specific services being accessed.

The 'principal service' data item broadly categorised almost all of the increase in the comparison group under 'Non acute - Clinical/social', while other principal service groups were relatively stable across each year for both the study and comparison groups. The provider types that increased most significantly following entry to the ISP were community registered nurses (increased to 31.7% of contacts), non-clinical psychologists (13.0%) and social workers (6.2%). For the equivalent 12 months following ISP nomination, the comparison group provider type that increased the most was categorised as nurse manager (45.8%). Other provider types declined to proportions below the study group; registered nurses (23.0%), non-clinical psychologists (4.7%) and social workers (3.7%).

The majority of non-admitted mental health ambulatory services were delivered face to face with around 57% of client activity, and a higher proportion (79%) of comparison group contacts in the 12 months following ISP entry or nomination. The remainder of contact type was primarily by telephone, around 14% for ISP clients and around 10% for comparison group.

4.4   Mortality and cause of death

The health care data linkage included mortality and cause of death records, with seven reported deaths of former ISP clients, and one non-client (Table 4.6). Two clients were accepted into the ISP but died during the transition into the Program. All other deaths were three or four years following exit from the Program.

Table 4.6 Mortality and cause of death

Client status	Sex	Age at death	ICD10 code	Cause of death
Former	Male	32	K55.9	Vascular disorder of intestine, unspecified
Former	Male	47	G93.1	Anoxic brain damage, not elsewhere classified
Former	Male	58	Y89.9	Sequelae of unspecified external cause
Former	Male	23	Y12.1	Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent
Former	Male	54	I67.8	Other specified cerebrovascular diseases
Former	Male	57	J44.9	Chronic obstructive pulmonary disease, unspecified
Former	Male	30	X78	Intentional self-harm by sharp object
Non-client	Male	53	I42.6	Alcoholic cardiomyopathy

Source: ISP client program data (n=50); NSW Registry of Births, Deaths and Marriages (RBDM)
Australian Bureau of Statistics Australian Coordinating Registry Cause of Death

All deaths were men with an average age at death of 44.3 years (median = 50.0). Cause of death is classified under ICD10 coding.[2] The causes of death are not presented here as related to the Program. They are consistent with complex health conditions characteristic of ISP clients, including deaths due to self-harm, poisoning and other chronic conditions.

4.5   Summary of ISP client and non-client health care service usage

Overall, health care usage for ISP clients declined substantially following entry to the Program compared to the non-client comparison group, including:

Hospital admissions

- ISP clients showed an increased number of inpatient admissions in the period prior to Program entry, reflecting unmanaged or escalating health episodes, followed by a substantial and sustained decline in the number of admissions in successive years once in the Program.

- Over the same before and after timeframe, the non-client comparison group showed a relatively stable lower level of admissions with a minor increase in the year prior to their nomination to the ISP, suggesting the circumstances leading to their nomination.

Admitted days in hospital

- In addition to the total number of hospital admissions, average admitted days per year per ISP client also escalated in the 12 months prior to entering the Program to 109.1 days, partially due to a small number of clients with long-stay admissions, statistically significantly different from the comparison group for the same period with average admitted days per year of 36.4 days.

- Following entry to the ISP, client average admitted days per year declined substantially in Year 1 to 78.5 days, with a sustained statistically significant further decline in Year 2 after entry to the ISP to 14.8 days, to a level below and not statistically different to the comparison group.

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[2] WHO Library Cataloguing-in-Publication Data, International statistical classification of diseases and related health problems. - 10th revision, Fifth edition, 2016.

Emergency department presentations

- Consistent with hospital admissions and admitted days per year, ED presentations showed a similar pattern of escalated events in the period prior to ISP entry, followed by a substantial decline following entry to the Program.

- ISP client average ED presentations per year increased in the 12 months prior to entry from 5.4 to 10.4, followed by a decline after entry to the Program to 7.8 in Year 1 and a further substantial decline in Year 2 to 5.9.

- Over the same period, comparison group average ED presentations per year increased from 5.2 to 6.5 prior to nomination, followed by a minor increase in Year 1 post-nomination to 6.6 and a further increase in Year 2 to 7.3.

Mental health ambulatory service use

- Non-admitted community mental health service usage was relatively stable for ISP clients, with a minor increase following entry to the Program.

- ISP client average number of non-admitted contacts per year were relatively stable prior to entering the Program, declining from 26.5 to 25.8, followed by a minor decline in Year 1 to 23.5 and an increase in Year 2 to 27.2; none of these changes were statistically significant.

- In contrast, over the same period the comparison group showed high variation in community based services, with average contacts increasing significantly prior to nomination from 15.4 to 30.9, followed by a further substantial increase in Year 1 to 45.4 and a subsequent substantial fall in Year 2 to 33.9.

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5. Economic analysis of cost of health service usage

The economic analysis of the ISP presented in the 2016 evaluation report examined the cost of the Program and compared this cost with the client outcomes achieved. Reflecting the high levels of complex needs, ISP clients receive high levels of support while in the Program, with an average client cost per year of $273,686.

This section presents the economic analysis of the health care data linkage. The admitted patient data collection includes Australian Refined Diagnosis Related Group (DRG) classification of each hospital admission, providing a link to standardised average cost of individual procedures. The DRG costs are an average NSW weighted estimate for each type of procedure, providing a comparable figure for admitted hospital procedures.

In line with hospital admission details presented in section 4, total DRG costs for ISP clients reflected the escalation in inpatient activity prior to entering the Program. The total cost of all ISP client-admitted hospital procedures increased consistently in the years leading to Program entry, peaking in the 12 months prior at $1.9 million, followed by statistically significant declines in Year 1 and consecutively in Year 2, returning to pre-program levels of around $0.5 million per year (Figure 5.1). In contrast, the non-client comparison group remained relatively stable, with a slight increase in the year prior to nomination to $0.7 million, reflecting circumstances related to their nomination. The comparison group total cost was not statistically significantly different in following years, with a decline in Year 1 to $0.4 million, followed by an increase in Year 2 returning to pre-entry levels of around $0.7 million.

Figure 5.1 Total admitted patient DRG cost per year
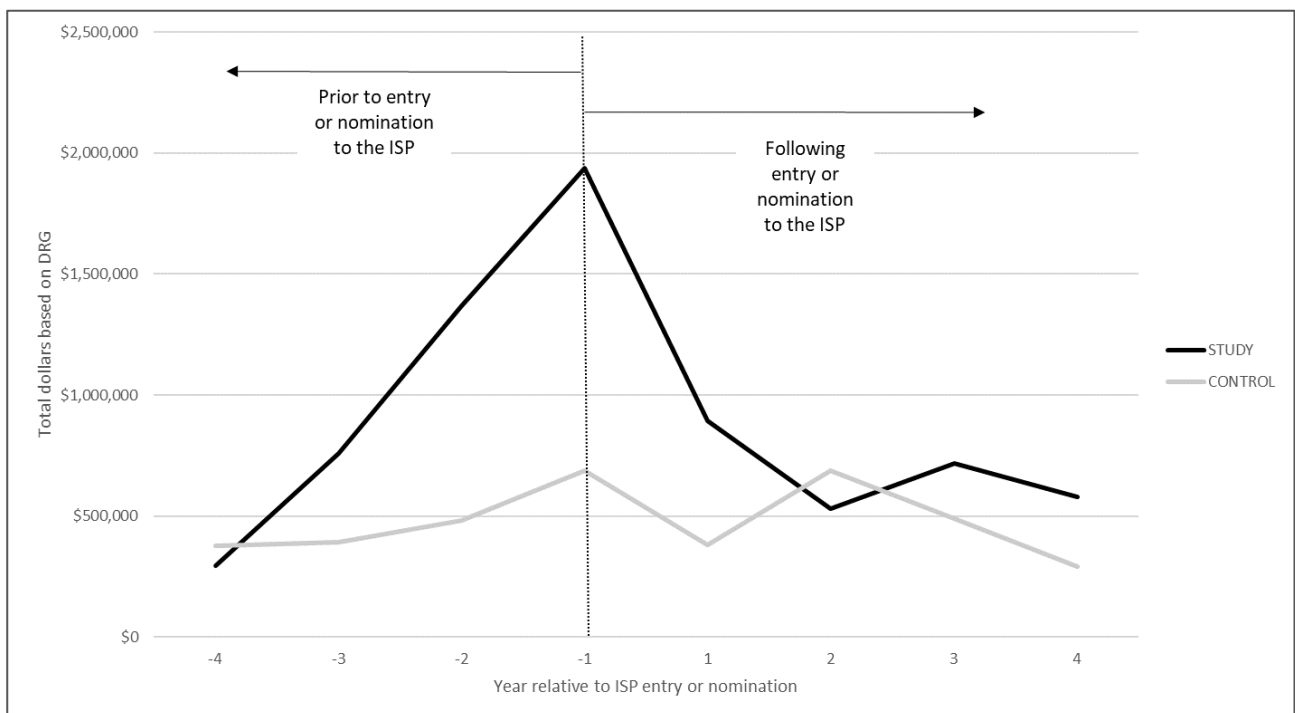
Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)

The total cost is presented for initial reference to present the consistent pre- and post-ISP trend, and to provide an indicative scale of admitted patient cost of around $2 million per year, compared to total program operating cost of around $10 million per year. The cost analysis assessed the average cost per person per year and the comparative differences between the study and comparison groups, as well as longitudinal changes for paired data within each group.

As the ISP client group showed increasing inpatient costs for multiple years prior to entry, initial comparisons were undertaken for average costs per person over two years prior to and two years after Program entry or nomination (Table 5.1). The ISP client group of matched data for the same individuals pre- and post-Program had an average cost for the two-year period prior to entry of $68,855, followed by a statistically significant decline post-entry to $29,713 (n=48, p=0.024). For the same 2-year pre- and post-period, the comparison group change in average cost was not significantly different, reflecting a relatively minor decrease from $32,456 to $29,659 (n=36, p=0.719). Bootstrapping was undertaken to examine the effect of the cost data which was right skewed in line with the small number of high-cost individuals. The bootstrap results reduced the confidence interval ranges moderately, providing a slightly higher level of significance for the ISP client group (p=0.016) compared to the not statistically significant post-nomination average cost for the comparison group (p=0.717).[3]

Table 5.1 Change in average DRG cost per client 2 years prior vs 2 years post

	Matched clients	2 Years Prior	2 Years Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Base data	48	68,855	29,713	-39,143	116,446	-72,954	-5,330	0.024
Bootstrap	48					-70,997	-7,308	0.016
Comparison group								
Base data	36	32,456	29,659	-2,797	46,219	-18,435	12,841	0.719
Bootstrap	36					-17,913	12,318	0.717

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
n=84, study group n=48, comparison group n=36, paired t-test on before and after clients and non-clients

In summary, the 2-year before and after figures show a statistically significant decline in average cost for the ISP client group of $39,143 and no significant change to the comparison group, who had a minor cost decline of $2,797 for the 2-year period.

The cost analysis then examined the changes in average cost each year for the 12 months prior to entry or nomination, followed by Year 1 and Year 2 after entry (Table 5.2). The results confirmed the statistical significance and consistent consecutive year declines in average inpatient costs for the ISP study group and provided a breakdown of the mixed change in costs for the comparison group over each post nomination year. In the year prior to entry to the Program, the ISP client group had an average cost per person of $40,335, around two-thirds of the average cost over two years prior to entry, indicating increased escalation of costs in the 12 months prior to entry. This was followed by a decline in average cost to $18,631, which was approaching but not statistically

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[3] Bootstrapping tests also examined normal, percentile and bias-corrected confidence intervals, which were not significantly different.

significant at the 0.05 level (n=48, p=0.0551). As for the two-year figures, bootstrapping was undertaken for the annual average costs, again moderately reducing the variance and estimated confidence intervals and validating a statistically significant change (p=0.0460).

The annual average figures also showed a further consecutive statistically significant decline in average inpatient costs in Year 2 from the Year 1 average of $18,631 to $11,082 (n=48, p=0.0180). This represents a decline in average cost per ISP client of $21,704 in Year 1, followed by a further decline of $7,549 in Year 2, a combined reduction over the two years of $29,753. The Year 2 average cost showed a total decline to below the comparison group for the corresponding Year 2 period.

Over the same timeframe, the comparison group average inpatient cost per person did not change statistically significantly, although costs declined in Year 1 following nomination from $19,068 to $10,605 (n=36, p=0.1177). The non-client comparison group showed a statistically significant increase in average inpatient cost between Year 1 and Year 2 after nomination from $10,605 to $19,055, to a similar level to pre-nomination (n=36, p=0.0256). This Year 2 increase for the comparison group was masked in the initial 2-year average figures and suggests ongoing hospital episodes and variation.

Table 5.2 Change in average DRG cost per year

	Matched clients	Year Prior	Year Post	Change	Standard deviation	95% CI Lower	Upper	p-value
Study group								
Y-1 to Y+1	48	40,335	18,631	-21,704	76,447	-43,902	493	0.0551
Bootstrap	48					-43,019	390	0.0460
Y+1 to Y+2	48	18,631	11,082	-7,549	21,339	-13,745	-1,353	0.0180
Comparison group								
Y-1 to Y+1	36	19,068	10,605	-8,463	31,655	-19,173	2,248	0.1177
Bootstrap	36					-18,664	1,738	0.1040
Y+1 to Y+2	36	10,605	19,055	8,450	21,746	1,092	15,808	0.0256

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
n=84, study group n=48, comparison group n=36, paired t-test on before and after clients and non-clients

These declines in average inpatient costs confirmed preliminary results reported in the completed evaluation study period and provided supplementary details of the cost offsets resulting from the ISP. The stabilising of ISP client health reflects the multiple types of support provided by the Program, perhaps combined with increased monitoring in the ISP, potential earlier identification, and early intervention of health care episodes.

The estimated cost of the decline in health services following entry to the ISP reflected changes in admitted patient and ED episodes (Table 5.3). Total inpatient admissions per year declined 50.5% from 293 to 145 after entry to the Program. The average cost of these admissions was firstly calculated using each episode DRG, indicating a 56.9% decline in the cost of procedures from $1.7 million to $0.7 million, an annual cost avoided of around $1 million. While DRGs generally provide more comparable cost estimates, being an overall average for all procedures in each category,

they also report implicit average lengths of stay. In the case of ISP clients, there are a proportion of long-stay additions well above the DRG average, which understates the total cost in these cases.

Table 5.3 Estimated ISP hospital costs avoided per year

	Pre-ISP entry	Post-ISP entry	Change	Percent change	Cost avoided
Total inpatient admissions[1]	293	145	-148	-50.5%	
Total admitted days	4,516	2,239	-2,277	-50.4%	
Mean admitted days/year	94.1	46.6	-47.5	-50.5%	
Total DRG cost	$1,695,495	$731,647	-$963,848	-56.9%	$963,848
Mean DRG cost per client[2]	$41,384	$19,115	-$22,269	-53.8%	$22,269
Non DRG admitted days	$4,816,577	$2,496,991	-$2,319,586	-48.2%	$2,319,586
Total inpatient costs	$6,512,072	$3,228,638	-$3,283,434	-50.4%	$3,283,434
Total ED presentations[3]	498	374	-124	-24.9%	
Mean ED presentations[2]	10.4	7.8	-2.6	-25.0%	
Mean ED cost per year	$6,074	$4,555	-$1,519	-25.0%	$1,519
Total ED costs	$290,832	$218,416	-$72,416	-24.9%	$72,416
Total ISP hospital costs	$6,802,904	$3,447,054	-$3,355,850	-49.3%	3,355,850

Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)
study group n=48, NSW Emergency Department Data Collection (EDDC) study group n=48
[1]Annual average over 2 years prior and 2 years post, [2]Annual average year prior and year post, [3]total year prior and year post, all cost figures adjusted to 2013-14 dollars

To examine this length of stay (LOS) component, the total LOS for all ISP client DRGs for the year prior to entry was 1,210 days, which is included in the total recorded admitted days of 4,516 calculated from the source linked admitted patient data (26.8% of total days). The average cost per day was separately calculated from source DRG records for each client, indicating $1,442 per admitted day.[4] This DRG based average cost is conservatively below published estimated admitted patient cost in NSW of $1,694 per day.[5] Combining the DRG average day cost with the total number of admitted days from the linkage datasets indicates total inpatient cost in the year prior to ISP entry of around $6.5 million. The DRG component reflects a 56.9% decline in post-ISP cost of procedures, and the additional length of stay component of admitted patient total cost reduced by 50.4%. Collectively, the DRG based component represents a post-ISP cost avoided of around $1 million, and the extended inpatient days plausibly reflect a further $2.3 million, a total estimated inpatient cost avoided of $3.3 million per year.

Emergency department presentations reflected the similar post-ISP decline of 25% but were not statistically significant. The estimated cost of ED presentations has been included in the total estimated hospital costs, indicating an annual cost avoided of $72,416 based on an average cost of $584.[6] This was a relatively minor component of estimated hospital cost avoided, with admitted patient costs accounting for $3.8 million of the estimated total $3.9 million if the decline in ED

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[4] Total DRG cost divided by the average DRG length of stay was averaged for all ISP client records = $1,405 in base 2012-13 dollars, indexed to 2013-14 dollars 2.6% = $1,442 per day.
[5] Independent Hospital Pricing Authority, National Hospital Cost Data Collection, Australian Public Hospitals Cost Report 2013-2014, Round 18, NSW admitted patient average cost per day.
[6] Independent Hospital Pricing Authority, National Hospital Cost Data Collection, Australian Public Hospitals Cost Report 2013-2014, Round 18, ED average cost per presentation $584

presentations is included. As no significant change was identified for non-admitted community based mental health services, this category is considered relatively neutral and was not included in estimated health care cost avoided.

In summary, the economic analysis of the health care data linkage showed:

- Reduced annual estimated health care costs post-Program of $3.4 million including:
    - DRG cost decline of around $1 million
    - reduced admitted hospital days of $2.3 million
    - reduced ED presentations producing cost avoided of $72,416.
- Estimated average health care cost avoided per client conservatively indicates a cost offset of $69,913 per ISP client, representing 26% of total ISP client cost.
- Combined with previously estimated corrective service cost avoided of $10,883 (4% of total Program cost) (Purcal et al., 2016), the total cost offsets per ISP client conservatively account for $80,797 per client, representing 30% of total Program cost per year.

6.   Summary of ISP health care findings

This health care linkage extension to the ISP evaluation has provided further evidence of stabilised health pathways for ISP clients and related cost savings for these clients to the broader government service sector.

Overall, the health care linkage has confirmed a consistent pattern of increased levels of hospital activity in the period leading to ISP entry, followed by substantial and sustained declines in services following entry. The decreases in hospitalisation include reduced frequency of admissions as well as a substantial decline in the duration and total admitted days per year. For the equivalent study period, the non-client comparison group reflected substantially lower and relatively stable use of hospital services.

The health care linkage focused on quantifiable health service usage and related estimated cost. This complements the ISP evaluation, which identified a wide range of positive outcomes for clients. Collectively the evaluation reports indicate that, in addition to the positive client outcomes achieved, the Program is plausibly generating cost offsets to partner government agencies accounting conservatively for 30% of annual program funding, with further substantial health care cost offsets plausibly continuing to accumulate over ongoing years.

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7.   References

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Appendix A Methods, supplementary information

Datasets

The linkage project from the NSW Ministry of Health Centre for Health Record Linkage (CHeReL) incorporated five datasets:

1. NSW Admitted Patient Data Collection (APDC): includes records for all hospital separations (discharges, transfers and deaths) from all NSW public and private hospitals and day procedure centres. The APDC records admission and separation dates and coded information including reason for admission, significant co-morbidities, and complications and procedures performed during the admission.

2. NSW Emergency Department Data Collection (EDDC): maintained by the Health System Information and Performance Reporting Branch of the NSW Ministry of Health and provides information about presentations to the emergency departments of public hospitals in NSW.

3. NSW Mental Health Ambulatory Data Collection: ambulatory mental health care is dedicated to the assessment, treatment, rehabilitation or care of non-admitted patients. It may include mental health day programs, psychiatric outpatients and outreach services (e.g. home visits). The data is reported as 'contacts' with outpatient service providers as opposed to 'episodes of care'.

4. NSW Registry of Births, Deaths and Marriages (RBDM): records all deaths in NSW including the Cause of Death.

5. Australian Bureau of Statistics (ABS) Cause of Death[7]: all deaths for which a coronial inquiry is not required must be certified as to cause and date by a registered medical practitioner and the certificate registered by the RBDM in NSW. Details of all registered deaths are forwarded to the ABS where cause of death codes (ICD-10) are applied.

Data linkage

The SPRC received preliminary linked datasets from CHeReL in March 2017, and ADHC supplied final supplementary de-identified mapping of each study group in May 2017. Identifying information such as name, address, date of birth and gender for each dataset is included in the Master Linkage Key (MLK) constructed by CHeReL using probabilistic record linkage methods and *ChoiceMaker* software (Borthwick et al., 2003). The CHeReL added a separate unidentifiable Project Person Number (PPN) for each person identified in the linkage, and assigned this reference across each of the linkage datasets. The five linked datasets were then provided to the SPRC research team to merge using the de-identified client ID from ADHC to assign study group of current, former or non-client and link to basic demographic information prepared during the core evaluation.

The final data linkage is estimated by CHeReL to be highly accurate, with a false positive rate estimated to be 5/1,000 Person IDs (0.5%). Probabilistic linkage approaches as used for the ISP datasets have been shown to provide robust linkage rates generally exceeding methods utilising statistical linkage keys (Taylor and Irvine, 2014). The linkage was undertaken in a two-step

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[7] Australian Bureau of Statistics and Australian Coordinating Registry Cause of Death Unit Record File

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process to ensure client and non-client confidentiality. Only the SPRC research team have access to the health data from CHeReL, and SPRC does not have access to the clients' names and are not able to link health data back to individuals.

Microsoft Access was used for linkage of de-identified study and comparison group codes and integration with ISP program entry and exit timeframes, for the time series and assessment dates for nomination to the ISP for non-clients, as well as integration with the limited demographic details for both the study and comparison groups.

Statistical analyses

The statistical analysis focused on comparative health service use and costs for current, former and non-ISP clients, before, during and after leaving the Program. The analysis focused on inpatient admissions and ED presentations, with additional health service use examined for trends and significant differences between the groups. The health data linkage scope did not include analysis of particular diagnoses or specific clinical improvements during time in the Program. The focus was on health service usage and related health system cost in context of Program and inter agency cost effectiveness.

Statistical analyses included total inpatient and ED services used by ISP clients and non-clients. Figures were annualised and summarised by quarter to develop the before and after time series framework relative to entry or nomination to the ISP. The aim was to determine whether ISP leads to reduced health service usage following ISP entry or nomination, to assess ISP costs compared to avoided costs to the service system.

The health care linkage analysis scope did not include more comprehensive matching methods such as use of propensity scores. The limited scope for the work verified similar baseline profiles between the study and comparison groups from the available demographic and diagnostic data. As nomination to the ISP requires at least 12 months residing in the Sydney metropolitan area, the service usage data prior to entry provided a sample for clients and non-clients, for pre-Program baseline characteristics and service usage.
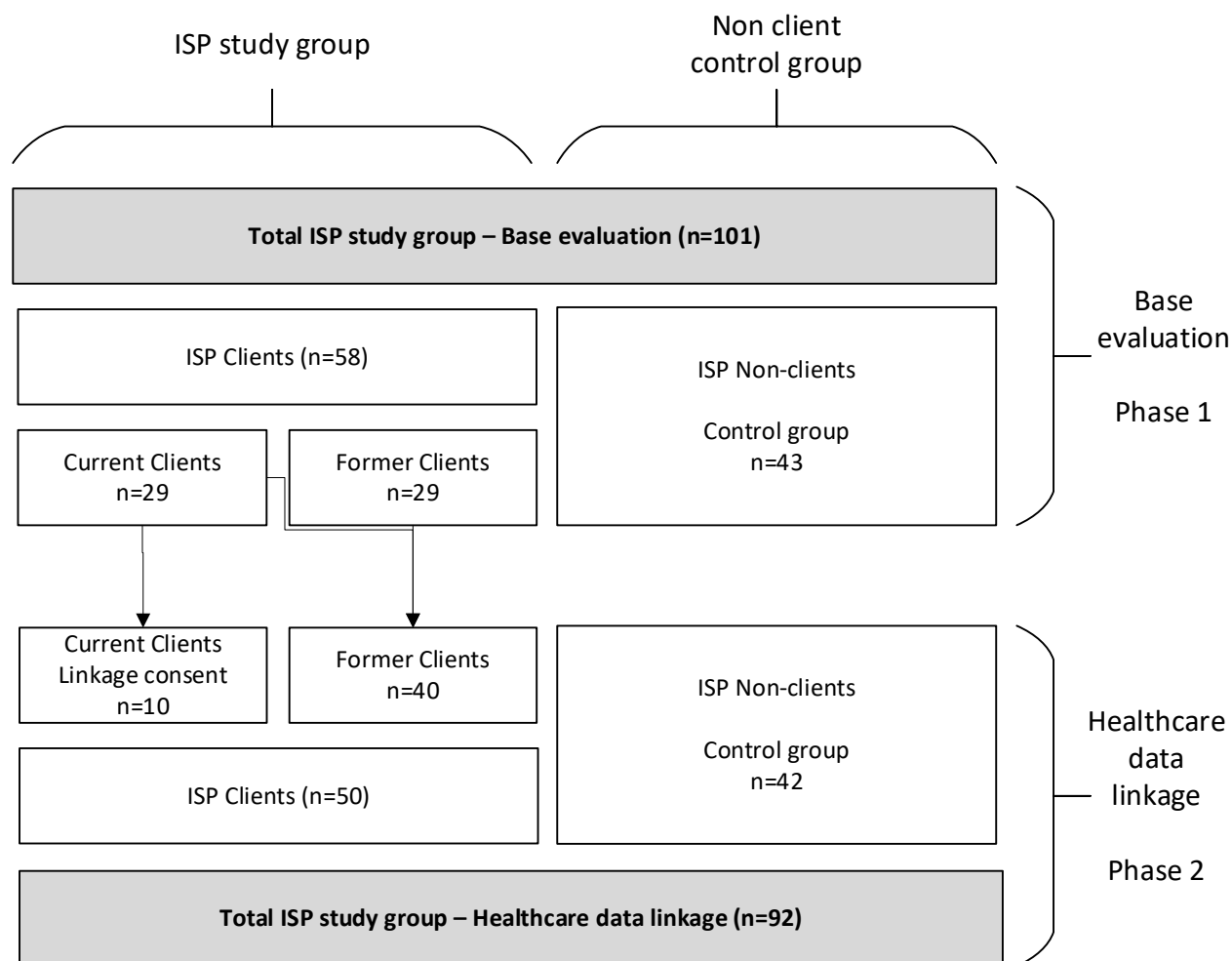
Study and comparison groups

Figure A.1 summarises the sample sizes, with the ISP client group on the left and comparison group on the right, for the completed base evaluation phase (top section) and the health care data linkage (bottom section). The completed evaluation phase study group of 58 ISP clients and 43 non-clients compares to the health care data linkage study group reflecting the limited number of current clients who provided ethics consent (n=10) and the increased number of former ISP clients who had cumulatively left the Program as at June 2016 (n=40), a total study group of 50. The non-client comparison group declined by one due to identification of a duplicate non-client code (n=42).[8] This group consisted of people nominated to the ISP but not accepted into the Program, and they may have different characteristics to the ISP client group not recorded in the dataset that might relate to why they were not accepted.

The health care data linkage provided sufficient sample sizes for statistical analyses of health service use and comparison between groups.

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[8] Non-client A072 was assigned an additional code of A077 which were treated as a single ID in the data linkage.

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Figure A.1 ISP study and comparison control groups, sample sizes

ISP study group

Non client
control group

Total ISP study group – Base evaluation (n=101)	
ISP Clients (n=58)	ISP Non-clients Control group n=43

Current Clients n=29	Former Clients n=29	

Base
evaluation

Phase 1

Current Clients Linkage consent n=10	Former Clients n=40	ISP Non-clients Control group n=42
ISP Clients (n=50)		

Total ISP study group – Healthcare data linkage (n=92)	

Healthcare
data
linkage

Phase 2

Health care data linkage timeframes

The data linkage provided all available health records retrospectively prior to entry or nomination to the Program. The timeframe for each dataset was generally from 1 January 2004 to 30 June 2016, with minor limitations for some content as presented in Figure A.2. Emergency department data was not available before 1 January 2005, mental health ambulatory data was only available to 2015, and cause of death records lag RBDM data by around four years. None of these limitations presented implications for the analysis given the overall large data across 12 years, with all former and non-clients having several complete months of data before and after entry or nomination to the ISP. The study and control cohorts predominantly aligned within the availability of complete data.

Figure A.2 ISP study groups and linked dataset timeframes
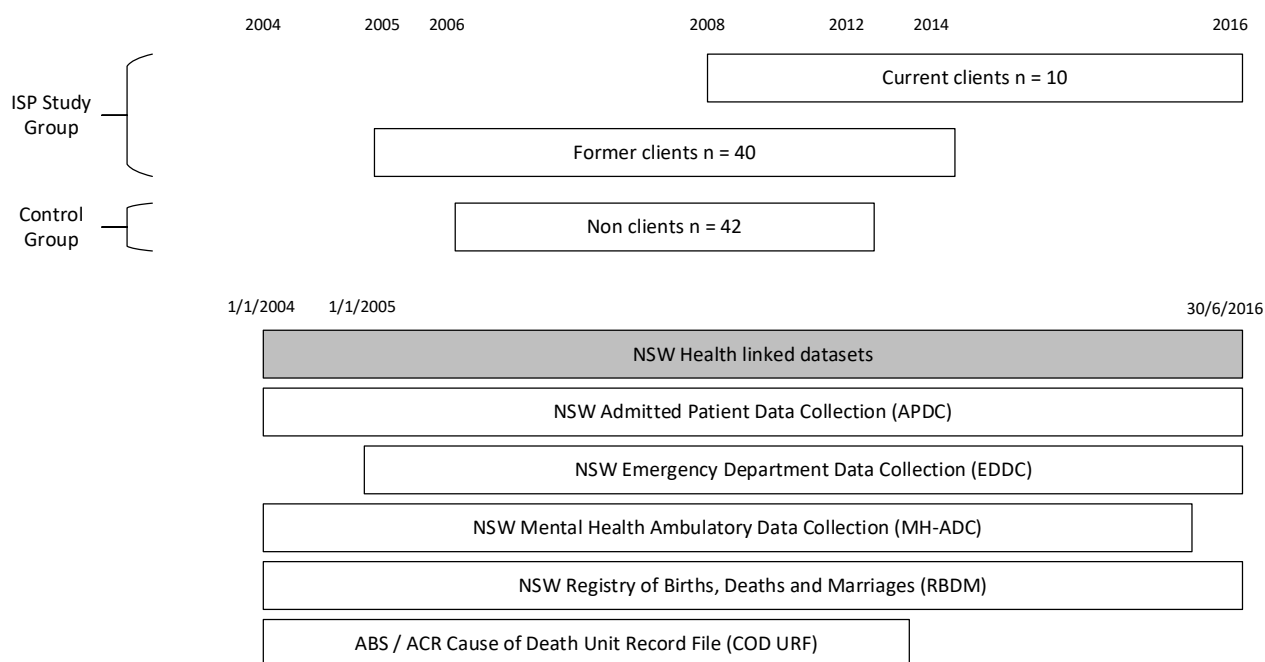
Notes: ABS = Australian Bureau of Statistics, ACR = Australian Coordinating Registry

Linkage records were adjusted for confirmed client consent and changes in status due to the later health linkage timeframe, updated ISP exit dates for newly transitioned clients, and addition of dates that non-clients were nominated for the ISP for alignment in the time series framework of comparable points in current health episodes at the time of nomination. Client and non-client age was standardised as at entry or nomination to the Program.

Time series framework

The health care linked datasets were each developed into a time series framework relative to the Program entry and exit of each client and the nomination to the Program for non-clients in the comparison group. Each health record was assigned entry, exit or ISP nomination dates from PPN client ID mapping to identify which individuals were study group or comparison group, when they entered the ISP, and the total duration each consumer spent in the Program.

The time series timeframe focused on quarters of each year, before and after entry, and was also summarised in annual aggregations. The quarterly focus provided a timeframe that was sensitive to before and after service usage trends and also provided a sufficient perspective that censoring was not considered a significant issue as the majority of clients (all former ISP clients and the comparison group) had available data for multiple years within the 12-year linkage timeframe. All client and comparison group individuals had at least 12 months in metropolitan Sydney prior to entry or nomination, in line with ISP nomination criteria.

Health care service usage and estimated cost

Health service usage for admitted patient, ED and mental health ambulatory services were prepared across the before and after time series framework, focusing on two years prior to and two years after entry or nomination to the ISP. The estimated costs across each cohort are primarily based on Diagnostic Related Group (DRG) classifications and cost weights providing established Australian resource usage figures for each procedure.

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The use of DRGs does not rely on micro costing of all items such as staffing, diagnostics, and medications for each individual, supporting a more uniform cost base for hospital procedures across both the ISP study and comparison groups. This provides a more consistent and comparable cost for each procedure with the focus on before and after or comparative health service usage, rather than variation between costs for similar procedures. DRG cost weights estimate a range of costs and services to the hospital delivering the care reflecting comprehensive costing to the health system.

As ISP clients are based in metropolitan Sydney, variation in costs across hospitals is not considered to be a significant issue. DRG version 6.0 classifications are used in the linkage with base cost figures in 2012-13 Australian dollars adjusted to 2013-14 dollars for integration with the completed report.

Additionally, the length of stay for admitted patient episodes was incorporated into the cost estimates. DRG figures include an average length of stay per procedure, but there are characteristically longer lengths of stay and high variation in psychiatric admissions, particularly for more complex needs patients, such as ISP clients. The cost of the total number of admitted days was separately estimated for comparison and identification of potential cost above the average DRG lengths of stay.

Health care costs are commonly right skewed, reflecting small numbers of patients experiencing extended episodes often with significant complications, and this was the case for the ISP study and control cohorts. The approach taken focused on arithmetic average costs to reflect full cost to the health system. Average cost figures are presented with measures of variance as standard deviation. Univariate analysis undertaken included two sample t-tests and paired t-tests for variation in service usage and associated cost before and after entry or nomination to the ISP. For cost figures, the approach incorporated routinely used non-parametric bootstrapping methods to test distribution assumptions while retaining the focus on arithmetic average cost or service use (Desgagné et al., 1998).

As the scope of the health care linkage did not include analysing clinical outcomes, more complex modelling of cost data using regression and matching was not undertaken, with the focus remaining on service usage patterns and average cost estimates. The health care data linkage costs were integrated with figures presented in the completed evaluation report including ISP cost and offsets for criminal justice.

Analyses were undertaken in STATA version 13.1 (StataCorp LP, College Station, Texas, USA).

Health care linkage ethics approval

Ethics approval for the project as a whole was granted by the UNSW Human Research Ethics Committee (HREC), and subsequent approval for the health care data was granted by the NSW Population and Health Services Research Ethics Committee through the CHeReL.

A waiver of consent was obtained for former ISP clients and the non-client control cohort as the data linkage was based on de-identified data from the Ministry of Health and CHeReL only. Seeking consent from former clients and those not accepted into the ISP would have been impracticable as clients always consent to program data management when they are referred to or enter the ISP and had therefore already consented to program data management. Also, contact information was generally unknown for both former ISP clients and those not accepted into the ISP

and there was no reason for thinking that former or non-participants would not consent if they were asked, given the de-identified form of the data and that the analyses would only be presented as aggregates, not at an individual level. Also, there was no risk of harm to individuals of analysing their de-identified data in aggregate form, but there was a likely public benefit, including personal benefit to ISP clients by having the Program continue as a result of the evaluation. Study participants had no contact with the research team.

Consent for the data linkage was sought from 26 clients currently in the ISP, with 10 clients providing consent. Due to the complex support needs of ISP clients the consent process was especially sensitive and continued for 18 months. The reasons why consent was not obtained for many clients was primarily based on clinical advice and complexities of the process (Table A.1). Clients for whom consent was not obtained were not included in the data linkage undertaken by CHeReL.

Table A.1 Reason for ISP client non-consent

	ISP clients	
Reason for non-consent	**N**	**%**
Consents signed by the client	10	38
Clinical recommendation to not approach the client	9	35
Clients who became distressed on discussion	5	19
Clients declined consent	2	8
Total	**26**	**100**

Source: ISP health care data linkage ethics application process

All figures presented in this report were aggregated for study and comparison groups with no client characteristics in unit form. All data transferred from CHeReL to the SPRC research team were made using secure connections. The health care data linkage has been undertaken in line with the study protocol and ethics approval.[9]

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[9] Evaluation of outcomes for people nominated to the Integrated Services Program (ISP) (AU RED Ref: HREC/15/CIPHS/39; CI Ref: 2015/08/606; CHeReL Ref: 2014.41-1)

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Appendix B Client and non-client profiles, supplementary information

Geographical and remote area dimensions were not included as the ISP operates only in metropolitan Sydney.

The data linkage study group were comprised of 60% men (n=30) and the comparison group 59.5% men (n=25), which is not significantly different (p=0.992). The distribution across age groups was also relatively similar, with slightly more 19–24-year-old non-clients and fewer in the 25–34 age group, again not significantly different overall (p=0.455).

The youngest clients in the ISP were aged 18 years, the minimum age for entry to the Program, with the oldest being 63. The average age of clients overall was 35 years. This ISP orientation towards younger people may help to change lifetime pathways. Men were on average slightly older than women, at 36 versus 32 years. The largest group of clients was 25–34 years old. Average age bands are presented based on age at entry or nomination to the ISP (Figure B.1).

**Figure B.1 Age distribution of ISP clients by gender**
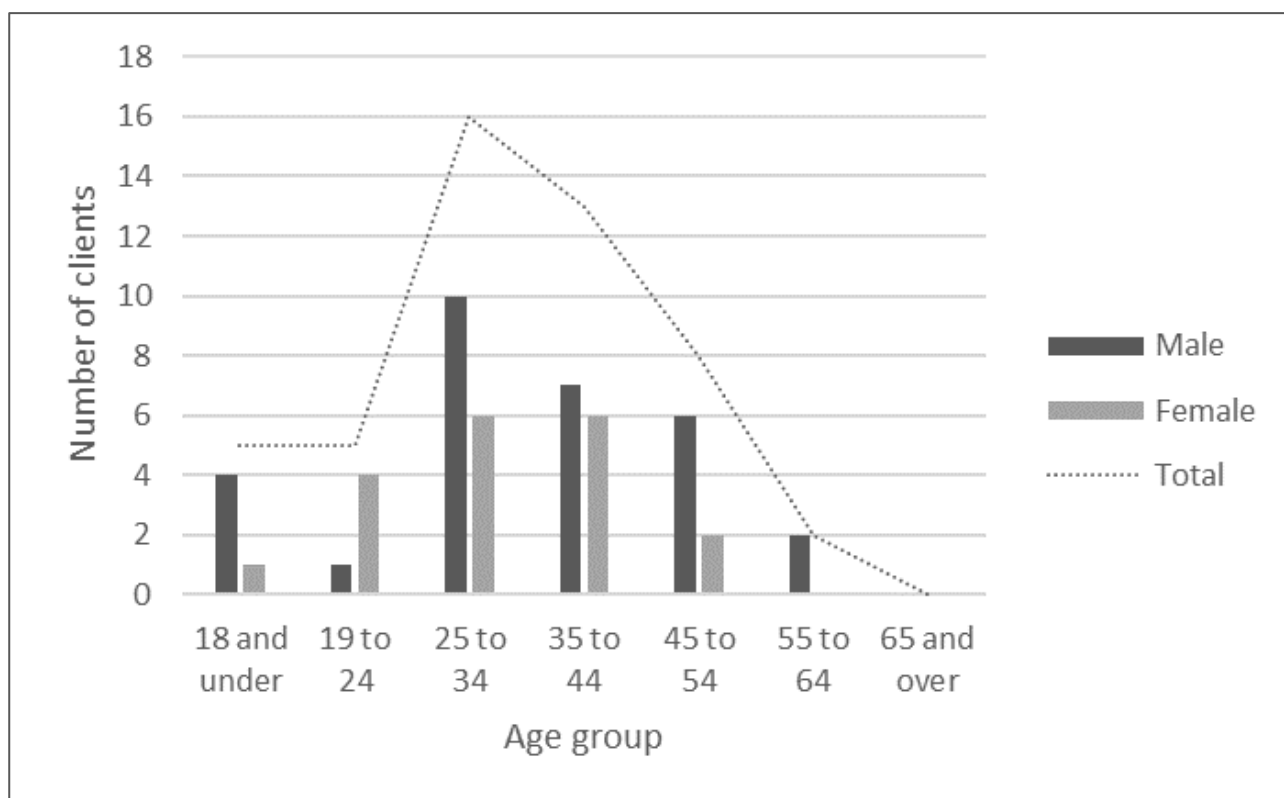
Source: ISP client program data (n=49, missing=1)
Notes: Includes current and former ISP clients. Client age is presented as age on entry to the Program. One client identified as female, age not available.

The sample of non-ISP clients in the comparison group (n=42) similarly included a higher proportion of men (n=26, 62%) compared to women (n=16, 38%) (Figure B.2). The age distribution was similar to ISP clients, with an equal average age of 35 years.

Figure B.2 Age distribution of non-ISP clients by gender
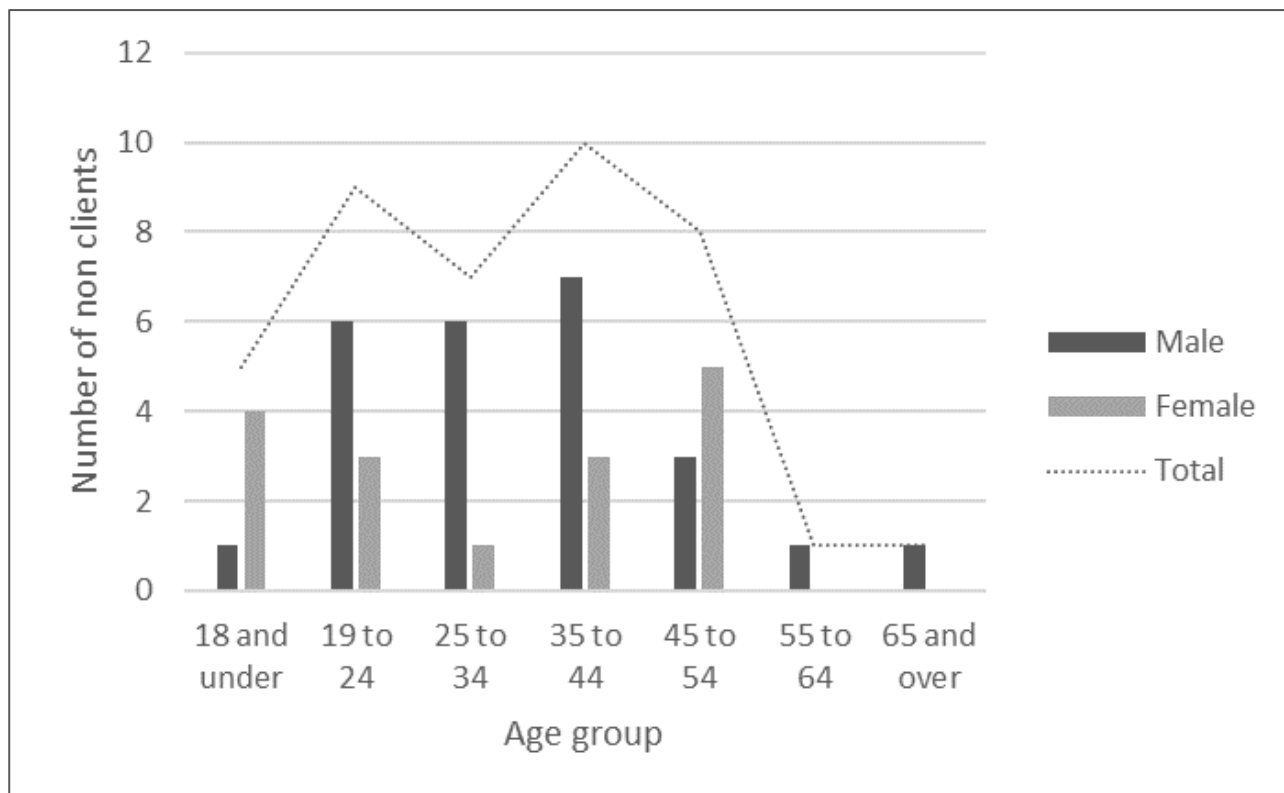
Source: ISP nomination data (n=41, missing=1)

Indigenous Australians comprised eight per cent (n=4) of the ISP client group and 10 per cent of non-clients (n=4) (Table B.1). These are small indigenous samples but relatively similar in each group. Compared with the NSW population, Indigenous Australians were over-represented among both ISP clients and non-clients (ABS, 2013), although the sample was insufficient to verify compared to metropolitan population subgroups and Australians with mental health conditions. The proportion of clients and non-clients whose Indigenous and cultural status was unknown was too high to verify whether the groups were significantly different.

The proportion of culturally and linguistically diverse (CALD) ISP clients was 26 per cent (n=13) compared to 14 per cent (n=6) in the non-client group. These proportions were slightly below the estimated NSW population (27.5%), but above the estimated CALD proportion for Australians with a mental health condition (9.8%). The sample sizes were insufficient to make statistically significant comparisons, but the figures show that ISP clients are culturally diverse.

Table B.1 Cultural background of ISP clients and comparative populations

Cultural background	ISP clients		Non-ISP clients		NSW population	Australians with a mental health condition[1]
	N	%	N	%	%	%
Indigenous	4	8	4	10	2.9	-
Cultural & linguistic diversity	13	26	6	14	27.5*	9.8*
Other	33	66	32	76	-	-
Total	**50**	**100**	**42**	**100**	**-**	**-**

Source: ISP client program data (n=50 –missing=1); ISP nomination data (n=42-missing=1)
Notes: 1. ABS 2012 * Language other than English

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Appendix C Longer term health care trends

In line with the limited resources of the health care linkage project, the analysis focused on the two years prior to and two years after entry or nomination to the ISP. However, preliminary assessment of longer before and after timeframes indicate that declines in post-Program health services were sustained over several years, including ongoing years following exit from the Program.

As an example, the number of hospital admissions per quarter were examined over 24 quarters (6 years) before and after entry and indicate sustained decreased admissions around the levels achieved at the end of Quarter 8 (Year 2), as shown in the figure below. These raw admission numbers reflect periodic variation but present preliminary indication of a sustained longer-term health service trend.

Figure C.1 Hospital admissions per quarter
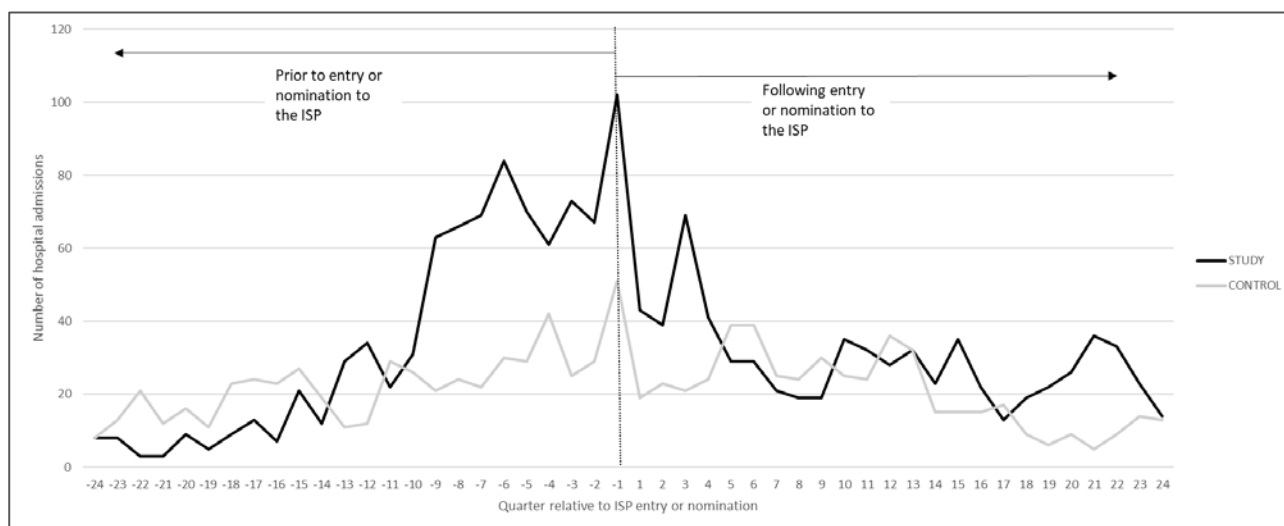
Source: ISP health care data linkage - NSW Admitted Patient Data Collection (APDC)

Further development of the linkage datasets could extend the time series framework to examine additional dimensions, for example incorporating ISP exit to specifically examine post-exit activity across each linked dataset. However, these longer-term timeframes are likely to reflect characteristic variation in small numbers of clients who may experience relatively high numbers of episodes. Combined with the declining episodes and relatively small client sample sizes, this may limit potential statistical analyses.