An approach to understanding resource usage data to inform strategic commissioning

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Contents

Executive summary

This paper provides an overview of the current knowledge on High Resource Groups in Scotland, and the potential for using data on this segmented population group to improve their anticipatory care and inform strategic commissioning and improvement decisions.

The contents of this paper will be of particular interest to Integration Joint Boards, especially when developing a strategic commissioning plan. The data and methodology will also interest those who have a role in planning and delivering services across health and social care, or those who are interested in how resource-use data can be analysed to focus on population groups.

In Scotland, data is collected at a national level and analysed to show how health and social care services are used by people each year. The data has found that approximately 2% of the population in Scotland accounts for 50% of the resource spent by health and social care partnerships and over 75% of inpatient hospital bed days.

The data can be analysed at different levels to show the characteristics of the High Resource Group population at health and social care partnership level, locality level, and GP practice level. At a national level, people who are in the 2% of the population associate with one of the following characteristics:

- people who are nearing end of life and experience increased use of services during their final 6 months of life
- people who remain in the top 2% year on year, and so have a consistently high level of service use, and
- people who experience time-limited escalations of need that result in short-term increased service use, resulting in them being part of the 2% group for one year but then reducing dependency.

The data has also shown links between being a High Resource Individual, chronic conditions, and socio-economic deprivation.

There is great potential for using this data to support strategic commissioning and for redesigning pathways of care. In particular, when viewed in the context of the wider system, the data can be used to understand the needs of the population, how people interact with services, and inform areas for improvement to a health and social care system.

Whilst the characteristics of people within this group can be summarised into the three points above, the reasons why someone becomes a High Resource Individual can be variable and complex. It is therefore important to analyse the data at a local level to see how contextual factors influence levels of need.

Developments to the data are ongoing, with a 'matrix' approach being designed so that partnerships can segment their population based on patterns of recent service use and clinical and demographic indicators. The common pathways for these segmented populations can assist partnerships to identify people at risk in the future.

Health and social care partnerships can access their High Resource Group data through the Source platform; with support available from a number of national organisations to access and analyse the data and use it to redesign their health and social care system.

Whilst this paper will focus on how resource-use data can be used to understand the small number of people who represent the top 2% of acute health and community prescribing service users, the methodology can just as successfully be applied to understand other population groups. It may, for example, benefit Integration Joint Boards to explore the many service users who have relatively low levels of service use but for whom the collective impact of this is high. An Integration Joint Board will then be able to discuss where changes are most likely to have the biggest impact.

Introduction

In recent years there has been an increasing interest in the relatively small proportion of populations that use a disproportionate share of care resources[i,ii,iii,iv], as care systems target the "triple aim"[v] of better health, better care, and better value. By focusing on this group, with the aim of improving the care and co-ordination of care for those who use services the most, there is potential to improve outcomes, enhance people's experience and reduce costs[1,2,3,4,7,10]. Achieving this will require:

- developing a thorough understanding of the demographic, clinical and social characteristics and risk factors of this group
- mapping and review of their service utilisation pathways that drive resource use and determine outcomes, and
- identifying evidence based improvement programmes for re-design of pathways[1,3,vi,vii].

The purpose of this paper is to provide an overview of the current knowledge on High Resource Groups in Scotland and how the data can be used to inform service redesign, better and earlier intervention and service improvement. The paper also provides an update on the future support to health and social care partnerships and examples of how partnerships have used High Resource Group data to focus improvement work.

Context

There is a growing body of evidence, from different settings, that small proportions of respective populations use a disproportionate share of care resources. For example, in Ontario, 1.5% of the population accounted for 61% of hospital and home care expenditure[viii]; in Alberta 5% of the population accounted for 66% of expenditure on primary, community and hospital care[ix]; and in the US, 5% of the non-institutionalised population accounted for 50% of healthcare expenditure[x].

Such skewed distributions are to be expected given the relative rarity for individuals of major health events requiring expensive interventions and are a reflection of the inherent risk-based nature of healthcare systems. Given the concentration of resources in this relatively small group, it is important to ensure that the care provided across all service areas is as effective as possible, both because they (and future people with similar risk factors) have significant care needs and because they are more likely than others to be affected by preventable system-level problems, given their frequent contact with the system.

Across the literature, there is variation in the scope of the services included for analysis, with some focusing on a single service type (for example, inpatient[xi] or prescribing[xii]) while others encompass a broader spectrum of services along the care pathway (for example, primary, community, residential and hospital care[13]).

Analysing expenditure and service use in this way requires that data is available at individual level and this is commonly the determining factor in the scope of services included for analysis; of the studies reviewed here, the most comprehensive scope of services mapped was for three quarters of all government-funded health and social care in Ontario[xiii]. Given that high users of one type of service have also been found to be high users of a variety of different healthcare services[3,13]; and that the High Resource Groups are often poorly served by current arrangements that fail to co-ordinate care across different providers and settings[1,2,6], it makes sense to extend the scope of services included in analysis to map as much of the pathway as possible in order to capture the system-level challenges and improvement opportunities that people's experiences reveal.

The studies reviewed here describe the High Resource Groups as characterised by a range of risk factors. There is a greater proportion of elderly people than in the general population and they have a greater burden of morbidity; they are more likely to have poorer self-

assessed health and a high prevalence of chronic conditions and multiple chronic conditions[1,3,12]; many have functional limitations and require assistance with activities of daily living (ADL)[xiv]; in addition, many have behavioural risk factors or face unmet social needs that exacerbate their condition[6,7].

In characterising this group, however, it is important not to oversimplify the analysis: not all people in the High Resource Group are the same and several studies[1,3,9,12,13,14] identify subgroups with more homogeneous needs and service utilisation patterns.

Segmenting the high resource cohort in this way is an important first step to developing successful redesign approaches as they will be more effective if targeted at specific groups most likely to benefit from them[1,14,xv,xvi]. There is significant turnover in membership of the High Resource Group from year to year and a number of studies use persistence (that is membership of this cohort across a number of years) to identify three broad groups as follows[10,13,14].

- **People near the end of life.** Health expenditure is concentrated in the last 6 months of life and there are significant opportunities for improvement in palliative care for people in this group.
- **People with persistent high resource use.** Between 30% and 40% of people in the top 5% spender tier remain in that tier for the following 2 years and there are opportunities for improved care management in this group.
- **People with episodic high spending.** Individuals in this group tend to have increased costs due to a sudden event, but expenditure decreases as the condition resolves and they drop out of the High Resource Group in subsequent years.

Others use clinical and social risk factors to segment the population[3,9]; of particular interest is the Blue Matrix[xvii] developed in British Columbia which embeds the High Resource Group within a segmentation matrix for the whole provincial population (with population segments as rows and (typically, but not always) service use as columns). This approach allows a comprehensive analysis to support strategic planning.

The improvement interventions for High Resource Groups fall into two broad categories[1,3,14]:

- **Planning** – this approach identifies *types* of people who are high users and their *typical* pathways, in order to plan, design and implement service change for future members of this group, and

- **Operational** – often referred to as "hot-spotting", this approach uses case-finding techniques to identify *specific* individuals who are currently high users or are at short-term risk of becoming so, in order to improve their individual care.

Successful programmes are reported to have several common attributes:

- a person-centred approach that comprehensively assesses individuals' risks and needs
- targeting people likely to benefit
- evidence-based care planning, monitoring and review
- promoting individuals' and carer engagement in developing the care plan and self-care
- providing appropriate care in accordance with individuals' preferences, and
- improved co-operation and co-ordination of care between providers and facilitating safe transitions in the care setting[2,6,17].

The last of these is a particular challenge to fragmented care systems with multiple providers. In Scotland, the Public Bodies (Joint Working) (Scotland) Act 2014 mandated the delegation of a range of health and social care services and associated resources to new Integration Authorities, thereby integrating the accountability for improving outcomes for local populations through a single commissioner in control of a pooled budget. The new health and social care partnerships are ideally placed to commission improvement programmes for High Resource Groups through their Strategic Commissioning Plans.

Who are High Resource Groups?

The Directorate for Health and Social Care Integration at the Scottish Government commissioned NHS National Services Scotland (NSS) to develop, through the Source programme, a linked individual-level longitudinal health and social care dataset as a resource to support partnerships in strategic commissioning. Individual-level data can be aggregated to various higher level groupings depending on the subject of interest, whether by care group (for example, dementia), individual characteristics (for example, age/gender), deprivation category, geography (for example, GP practice) or service utilisation.

As the data is held at individual level, it has been used to produce resource analyses for partnership populations. To date in Scotland, the term used to describe this group has been "High Resource Individuals" (HRIs) but this has been felt by many to overemphasise the importance of financial cost and fail to give priority to the needs of the individuals that ultimately drive their use of resources. Across the literature, there is variation in the terminology used, with some of the most notable being: "High Cost Users"[xviii], "High Cost-High User Patients"[3], "Frequent Users"[3], "High Need-High Cost Patients"[1, 5 xix], "High Cost-High Need Patients"[2] and "Super Utilisers"[7].

It is difficult to use a term which suits all sectors and situations, but to convey the resource element of the data, and the fact that it can be segmented in a variety of ways, the term High Resource Groups or High Resource Individual is used in this paper. As explained in this paper, the purpose of the data and the methodology is to understand how the system can better meet people's needs. It is therefore recommended that a narrative is used to engage teams, in addition to using the term High Resource Group.

The Source linked health and social care dataset brings together established national individual-level data collections relating to inpatient and day case admissions, new consultant-led and A&E outpatient attendances and community prescribing. Together, these services account for around 46% (or £5.4bn in 2014–2015) of territorial health board and local authority health and social care expenditure and reflect the activity in these areas of almost 4.5m service users. The range of services held within Source is being extended to include social care, community healthcare and other services and further work to incorporate third and independent sector activity is also being progressed. For the purposes of this paper, most figures relating to High Resource Groups will be based on the core health services listed above.

To define High Resource Groups, we calculate the total annual individual expenditure for each service user. The population is then ranked based on annual expenditure with the most resource intensive individuals who cumulatively account for 50% of total expenditure described as High Resource Groups or individuals for any given year (see Figure 1). This has been performed for each year from 2010–2011 to 2014–2015 and figures quoted in this paper will, unless otherwise stated, refer to 2014–2015 High Resource Groups. Live (estimated) costs will allow more up-to-date data to be used in future.

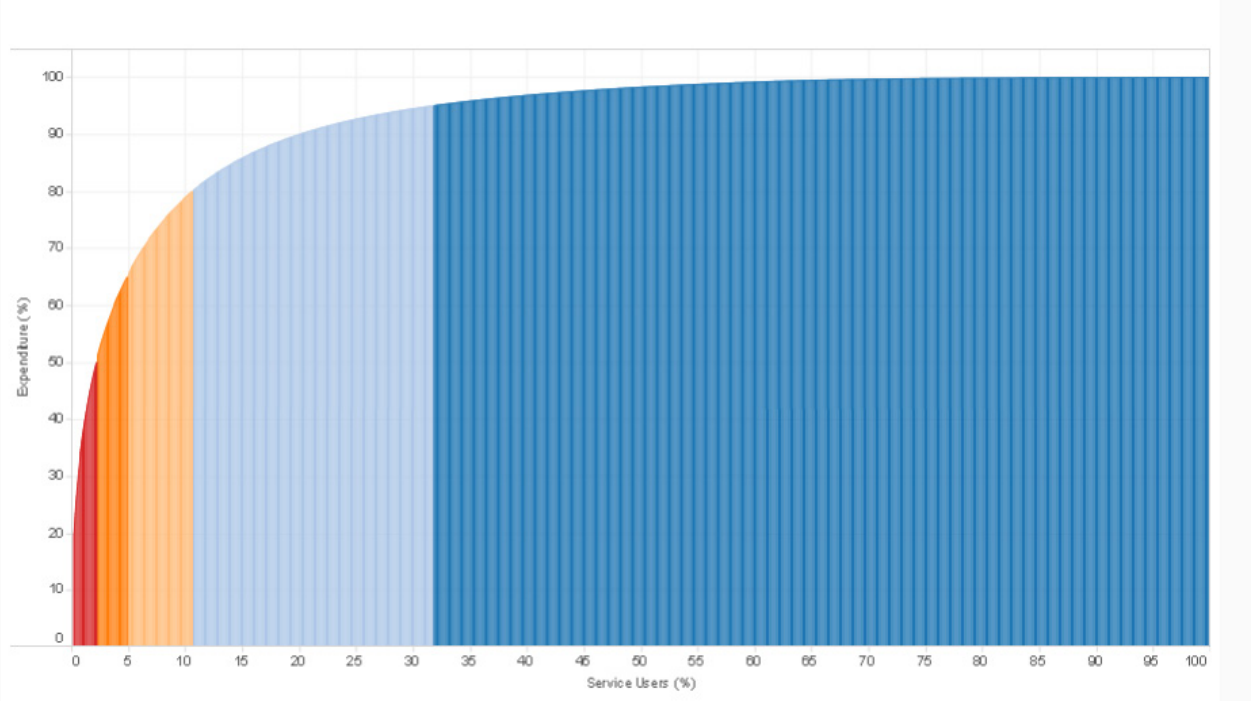


Figure 1: Ranked cumulative costs distribution showing High Resource Groups (red) and lower cost populations (orange through to dark blue)

Appendix A shows the scope of resources included in the High Resource Group analysis for the core health datasets; and also for those partnerships for which social care and other services have been linked in Source.

In 2014–2015, High Resource Groups had a median expenditure of £18,000 per person compared to £135 for other service users; 16.6% of the population didn't use any of the mapped services.

The characteristics of High Resource Groups

The term High Resource Groups is used to define the 2% of the population that account for approximately 50% of hospital and prescribing resource. The reasons why someone is part of this 2% group vary considerably. For some, it will be because they have a high level of need that requires an equally high level of care and support. There will also be those for whom the health and social care system has not been able to meet their needs in the most appropriate way, and as a result have been required to interact with emergency services and acute healthcare services more than is needed. It is likely that many of the people who make up the 2% of the population are simply part of this group because there is no meaningful alternative in the community that would reduce their need to interact with acute healthcare services. The value of looking at this population is therefore to see where opportunities exist to redesign services so that people can be cared for and supported in the most suitable environment, thereby enhancing their care experience and personal outcomes.

The 2% of the population is made up of people of different ages, from different social situations, and with varying levels of need. The characteristics of people that make up the 2% within each health and social care partnership will vary depending on local factors.

The value of the data is that it can be analysed to show the characteristics of High Resource Groups at different levels; such as at a partnership level or down to locality and GP practice level.

Using national data on hospital and prescribing costs, just over 100,000 people (approximately 2% of the population) are defined as being part of the High Resource Group in any given year. People in this group are more likely to be female (54%) and older adults (60% aged 65+, 4% under 18 and 36% aged 18–64). With the addition of other datasets the characteristics may change.

Over 80% are thought to be suffering from at least one chronic condition with most of these (57% of all High Resource Groups) experiencing some degree of multimorbidity. The prevalence of chronic conditions and level of multimorbidity amongst High Resource Groups increases with age. Figure 2 shows the distribution of morbidity amongst High Resource Groups compared to the general population. Most prevalent conditions are cancer (24% of High Resource Groups), coronary heart disease (23%) and cardiovascular disease (21%). The condition with the greatest risk ratio was dementia, with people who are part of High Resource Groups 46 times more likely to have been diagnosed with dementia.

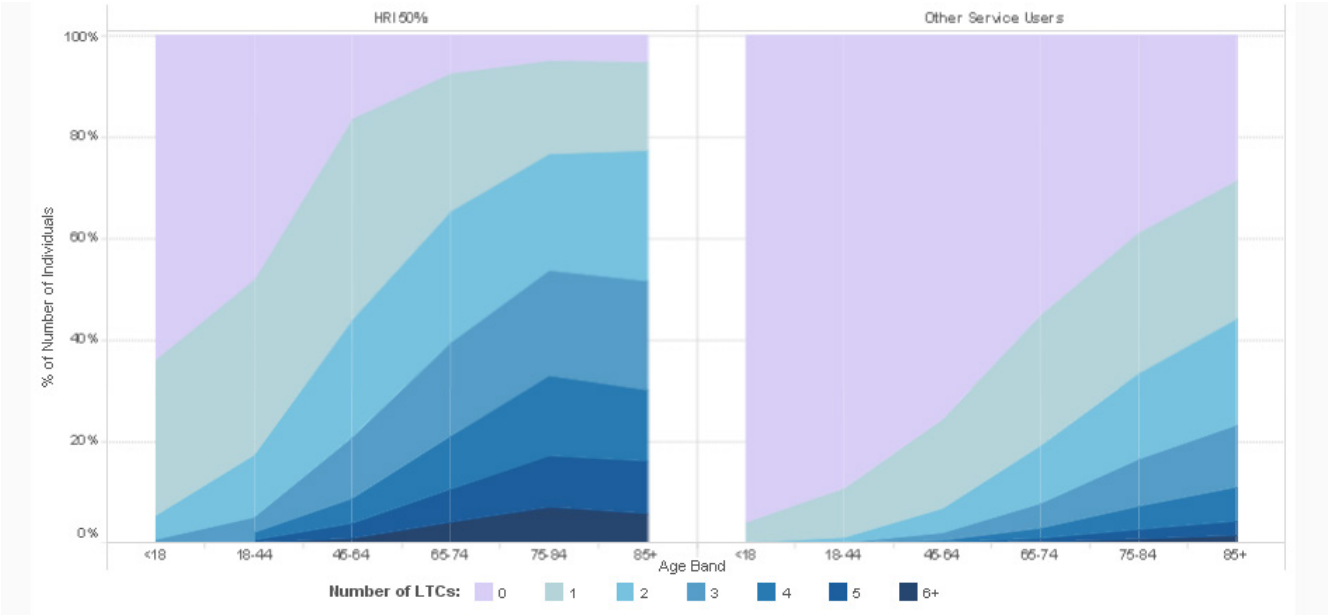


Figure 2: Rates of multimorbidity by age group for High Resource Groups and other service users

There is a link between proximity to death and High Resource Group status. Over 18% of people in High Resource Groups will die that same year and another 13% within the following year. High Resource Groups spend more of their last 6 months of life in hospital and are more likely to die there.

Of the people within this group who survive into subsequent years, between 20% and 25% remain persistent high resource users from one year to the next with the remainder falling to lower levels of resource use; 10% of surviving people within this group will remain as such for the next 2 years. For example, surviving individuals within this group between 2012–2013 and 2013–2014 used £848m and 1.5m unplanned bed days in the first year; and £874m and 1.6m unplanned days in the second. Those that were part of this group over 3 years to 2014–2015 used £350m and 700k unplanned bed days each year.

There appears to be a link between deprivation and High Resource Group status with these people found disproportionately in communities with greater levels of deprivation than the

general population (or service users). This appears to be more pronounced in younger age groups (see Figure 3).

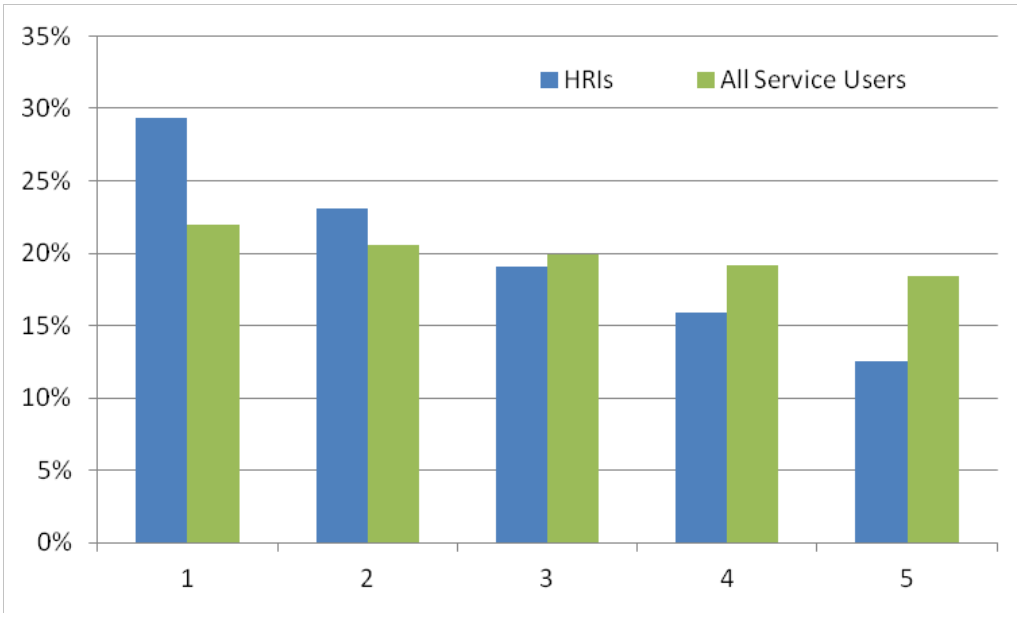


Figure 3: Distribution of High Resource Groups and other service users aged 18–64 across deprivation quintiles (1 is most deprived)

By their very nature, High Resource Groups make disproportionate use of services. The extent of this varies, with the 2% of the population using:

- 73% of unplanned and 56% of planned hospital resource; general medicine and long stay specialties have the highest proportion of use by High Resource Groups
- 23% of hospital day cases
- 12% of A&E attendances
- 7% of new consultant-led outpatient appointments
- 11% of community prescribing costs, and
- 75% of delayed discharges of care (based on estimates from pilot study).

Pilot work also suggests that the majority of social care expenditure is also linked to High Resource Groups. This includes most care home, community mental health and home care expenditure.

Variation can be found in all of these characteristics across the 31 health and social care partnership areas. For example, the proportion of the population that makes up the High Resource Group cohort varies across partnerships as shown in Figure 4; and there is similar variation between localities within partnerships. Throughout this paper, the 2% of the population refers to the national picture.

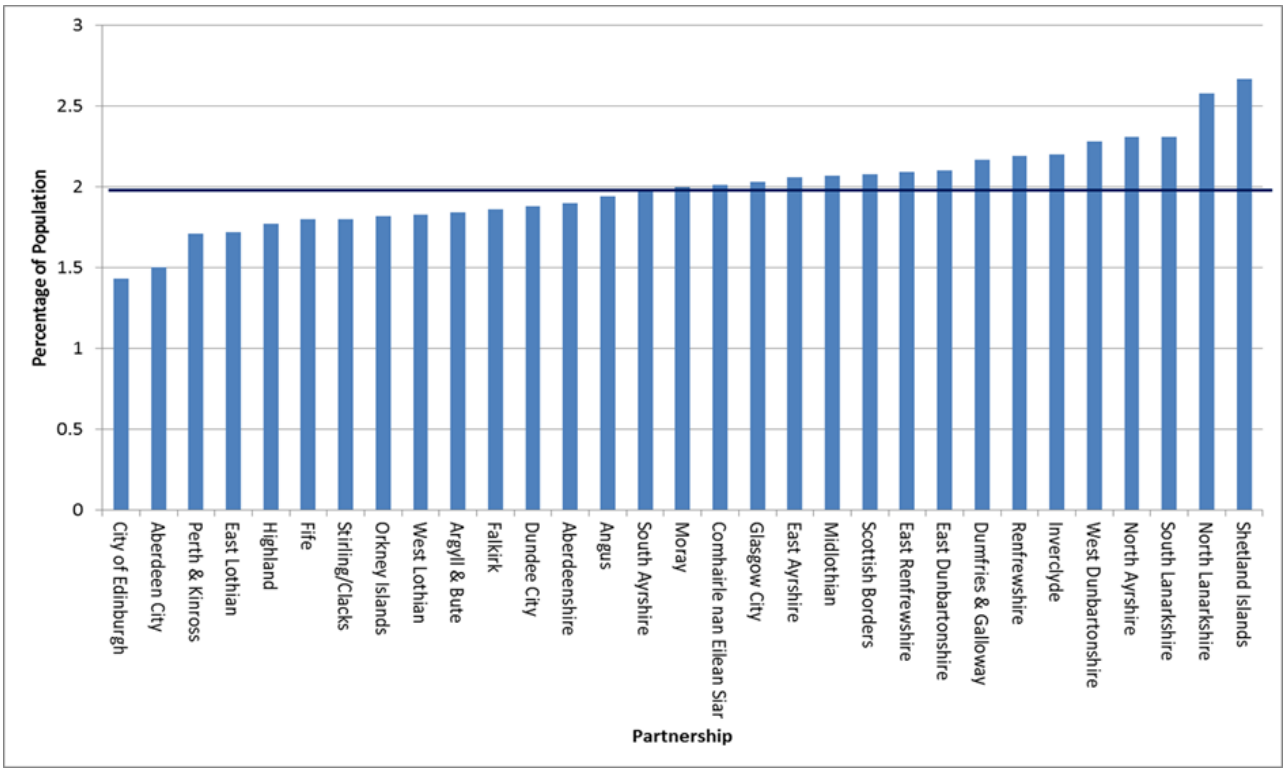


Figure 4: High Resource Group proportions for Health & Social Care Partnerships

Planned developments to support health and social care partnerships

Work is currently progressing to help partnerships develop a deeper understanding of High Resource Groups as a population, including the factors that impact on an individual's likelihood of becoming part of this group, and for remaining year on year. This relates to both individual characteristics as well as the service model drivers. This work is focused on three areas:

- segregating the population into meaningful subgroups that we expect to display similar characteristics in service use
- mapping the pathways and flow through the care system for these sub-populations, and
- modelling the risk factors associated with new and persistent High Resource Groups.

A methodology is being developed to segregate both High Resource Groups and the general service user population into more distinct and uniform groups. This has been done across two dimensions based on:

- the patterns of recent service use, and
- morbidity and life circumstances.

This 'matrix' view of the population can be applied at any level from national down to locality or GP practice population and, in each 'cell' of the matrix, we can have some expectation of similarity in the manner by which people access services and move between the community and institutional care. In particular, by focusing on smaller populations of High Resource Groups within localities, there is greater potential to use local understanding and intelligence to contextualise the data. An example of the latest version of the classification matrix template as applied to High Resource Groups across Scotland can be found in Appendix B.

Services may not be optimally designed to provide care as the nature of morbidity changes. Mapping current service pathways visually can evidence conformance (or lack of) with expectations, highlight inconsistencies and irregularities and provide a visual tool for engaging in service redesign and service improvement. Figure 5 presents the pathways of care for high resource users of geriatric services, demonstrating how they flow through the

health and social care system over a 12-month period. This demonstrates how people can flow through different routes from being resident in their own home into hospital. From hospital, many people will experience a delayed discharge of care while a care package, home adaptations or a care home place is found. For many individuals, a geriatric hospital inpatient unit is used to provide end of life care.

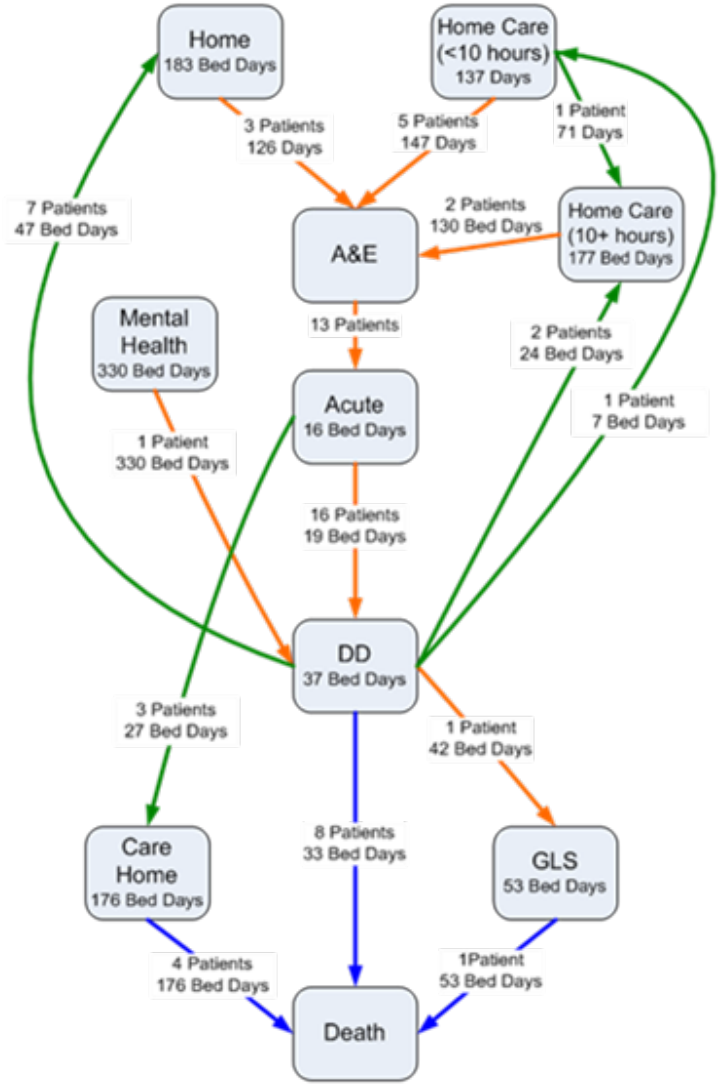


Figure 5: An example of pathways of care for high level users of geriatric hospital services

Access to both the classification matrix and the pathway view of partnership, locality, and GP practice populations will be made available in due course through a combination of the Source platform and local analytical and improvement support.

The final strand of work mentioned above will investigate the potential to predict future High Resource Groups and therefore allow the potential to intervene. This will involve a retrospective study of current and historic High Resource Groups using Source data. By modelling the key demographic, clinical and factors alongside service interactions in the years prior to becoming part of this group, it may be possible to identify key risk factors that can highlight people at risk.

How to use High Resource Group data for improvement

The value of High Resource Group data is that it can be used to challenge how health and social care systems are currently designed compared to the needs of the people who interact with care and support services the most.

The data can be used to enhance a health and social care partnership's understanding of its population and the pathways their population experience. Partnerships can then use this understanding to inform strategic commissioning decisions so that, in the future, people with similar needs, conditions or life situations can be supported at a more appropriate time.

To achieve this aim, the data should be used to understand how the health and social care partnership currently cares for and supports its High Resource Groups. The partnership can then explore how a different approach could have improved outcomes for those individuals and test changes with people who have similar needs. By using an improvement cycle, the partnership can then evaluate whether the change in approach improves outcomes for people, and if so, sustain this change so that it becomes a new model of care.

The data is not intended to be used as a real-time database for professionals to target individuals, but rather to inform changes to service delivery that could improve the quality of life for people who require support in the future.

The Context section explains that people who are part of High Resource Groups can be broken down in to three broad categories: those nearing end of life, those who remain in this group for more than one year, and those who are only part of this group for one year but who do not die. Thought was given to whether a different approach should be used to improve outcomes for people from each of the three groups. For example, it could be argued that people who remain part of High Resource Groups year after year have needs which require a different type of support when compared to people who experience a sudden, short-term increase in dependency on services, which subsequently reduces. It is recommended however that a similar improvement approach is followed as no matter which broad category a High Resource Group population falls into, it is important to first understand:

- the needs of the people

- the types of services and support available
- the pathways of care they experience, and
- how people interact with services.

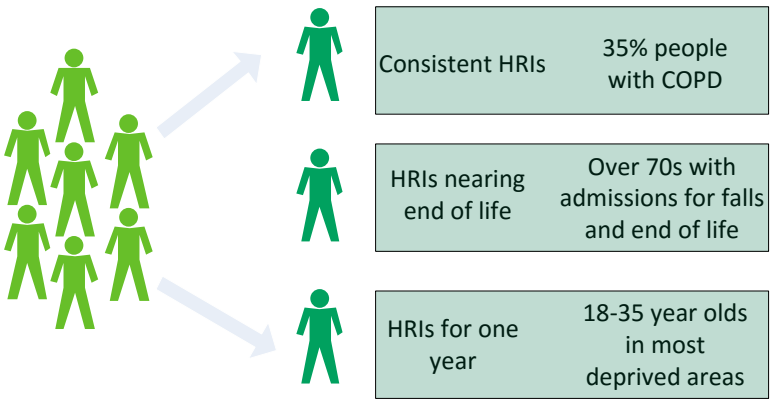
After considering these points the intelligence and data can then be used to consider:

- options for redesigning pathways of care and routes into care
- trigger points for identifying people at risk of escalating need, and
- interventions to support people sooner.

It is at this point that the approach may differ depending on the broad category of the High Resource Group, as the interventions to be tested will be tailored to the group's needs and behaviours.

An outline of how to structure this approach would be as follows.

1. Use resource usage data to understand who your High Resource Groups are. Analyse and discuss the data as a partnership to better understand the characteristics and needs of your population. Take the analysis and discussion to locality level to bring out contextual factors to the High Resource Groups. Identify the main population groups and the pathways of care they experience.



2. Explore how you support and care for people with the needs that were identified by the data and discussions. Assess the current state of provision and identify where there are gaps in support or areas where more preventative services might improve people's outcomes. The development of pathway analysis within Source will support partnerships to understand which services their High Resource Groups interact with.

3. Explore the pathways of care that your High Resource Groups experience, based on their needs and characteristics. Partnerships can use locally-held data, feedback submissions, and individual stories from people who use services to produce pathways of care to show how people experienced the health and social care system. The development of a 'matrix' view through Source will further support partnerships to segment their population and produce common pathways which show how people interact with services. The partnership can then experience the pathways from the individual's perspective to identify where a change in service delivery could improve outcomes for people with similar needs in the future. The results of this can be scaled up to see the potential impact of changing what you do for your entire population. These new ways of working are tested so that the partnership can redesign pathways to better meet their population's needs and improve the effectiveness and efficiency of services.

4. As well as informing the design of a health and social care system, the data can be used to explore ways of identifying people with escalating need who are at risk of becoming part of the High Resource Groups in the future.

   This can be achieved by bringing together a team that represents the variety of services across a system to look at the pathways of people within the High Resource Groups. The team can identify the trigger points that resulted in escalated need. These trigger points can then be identified in future pathways and interventions put in place to reduce risk.

How can we support health and social care partnerships?

A detailed guide will be available to help health and social care partnerships to use the data to focus improvement activity. The guide explains how to:

- access and present the data to your health and social care partnership
- structure a workshop in which the data is used to stimulate discussion about the needs of your population
- explore the support and care you provide in order to map your system, and
- put together an action plan in which you link your local priorities to the key themes from data and discussion which result in specific actions on how to increase the pace and scale of service change and improvement.

The High Resource Group data provides the starting point to this process. Data alone, however, is unlikely to provide the solutions for improving outcomes for your population. This can only be achieved by combining the data with the knowledge and expertise of your local system. The ability to use the data to inform changes in how you care for and support your population will therefore depend on the willingness and enthusiasm of those working within your health and social care services to explore and embrace change.

A number of national teams are able to support you use the High Resource Groups data (and other resource usage data), and will guide you through the process by providing expertise in analysing and presenting data, and using it to inform improvement.

The Information Services Division (ISD) of NSS has the skills to source, link, analyse and interpret data relevant to health and social care. Working alongside your area or team, ISD can help you understand data on health and social care resource use by:

- getting direct access to High Resource Groups data for your area and help you to link these to other locally held data
- analysing, interpreting and further developing outputs that show the characteristics and service model drivers relating to your High Resource Groups – this can be done at different levels such as partnership, locality and GP practice level

- using the classification matrix to understand how the High Resource Groups are distributed across your population and investigate historical patterns of service use
- mapping current service and client pathways visually, providing insight to the groups to identify where improvements might be made
- applying and further developing the risk prediction algorithm to detect future High Resource Groups and identify key risk factors – this also includes forecasting future trends within this population, and
- modelling alternative pathway scenarios to understand the impact of a service change and any potential improvements, including evaluating the impact of the service change.

The Source team can be contacted at NSS.Source@nhs.net and access to your Local Intelligence Support Analyst can be arranged through NSS.LIST@nhs.net

Healthcare Improvement Scotland's Improvement Hub (ihub) has improvement expertise to support health and social care partnerships use data to inform strategic commissioning, as well as planning, testing and implementing improvement work. The ihub can support partnerships to:

- understand the current state of your health and social care system by combining resource use data with local knowledge from planning and delivering services
- use this intelligence to map your health and social care system and assess the skills and knowledge of people who work within the system
- explore how people experience the health and social care system by analysing the pathways of care that they experience and how people transition between different types of care
- investigate the opportunities to delivering support at the most effective time for the individual, including options for identifying people for earlier intervention that will reduce the likelihood of crisis
- design tests of change to pathways of care, including the design of measurement and evaluation plans
- prepare the conditions for improvement, including the human factors of change, to enable tests of change to be completed effectively, and
- implement and sustain changes to the health and social care system.

The Strategic Commissioning Team within Healthcare Improvement Scotland can be contacted at hcis.strategiccommissioning@nhs.net

Examples of how HSCPs focus on their High Resource Groups

The three national teams, detailed above, are supporting health and social care partnerships to use the High Resource Groups data to inform improvements to pathways of care. The initial work to explore the current state of their population's needs compared with the services available has presented some recurring themes for how simple changes can lead to improved outcomes:

- improve communication between services so that demand can be pulled rather than waiting for moments of crisis
- raise awareness of the services available so that people know how they can access support, and
- make it easier for people to access the most appropriate service when they need support, thereby reducing the likelihood of escalating need.

There will however be complex changes around behaviours and culture which require a long-term commitment.

Case studies of how health and social care partnerships are focusing work on their High Resource Groups are included below.

The Glasgow City HSCP explored its High Resource Groups and noticed the difference in outcomes between this group and the rest of their population in relation to end of life. The data showed that High Resource Groups in Glasgow City were on average spending three times more days in hospital in their final 6 months of life. The partnership used this data to stimulate discussion and inform work to improve palliative and end of life care in the city. The first stage of this has been to understand the current state of palliative and end of life care by mapping the services available to people with palliative care needs. This picture of the current system was then combined with intelligence from a self-assessment of staff working across health and social care, which had already been initiated by the partnership to assess against the *Strategic Framework for Action on Palliative and End of Life Care*. Following this initial information and data gathering phase, the partnership will agree next steps based on a range of inputs, including the self-assessment, mapping, local palliative care groups and NHS Education for Scotland's educational needs analysis.

The Argyll and Bute HSCP held a workshop with representatives from across their health and social care team to explore data on its High Resource Groups. The partnership was particularly interested in exploring how the geography of where people live affects outcomes, and so analysed the data at locality level to see if the type of resource use differed across the partnership. The data presented interesting results; most notably that

the localities with the highest proportion of healthcare High Resource Groups had the lowest proportion of social care High Resource Groups. The partnership also found that over 70% of their healthcare High Resource Groups were aged 60 years and above. Argyll & Bute therefore decided to tailor their older people work on the pathways of care for people in one of their localities to see what lessons can be learned for the rest of the partnership.

Appendices

Appendix A – High Resource Group analysis

The following tables show the extent of the services mapped to individual level and included in High Resource Group analysis. Figure A1 shows the analysis prior to Source being populated with social care and community health data.

	Scottish Total[1]	Mapped to individual[2] level	HRI[3]	Mapped Proportion of Total Expediture	HRI proportion of Mapped Expenditure
	£m	£m	£m	%	%
Unplanned Inpatients	2,612	2,612	1,908	100%	73%
Elective Inpatients	806	806	455	100%	56%
Other Inpatient	38	38	23	100%	61%
Day Cases	453	453	104	100%	23%
A&E Attendances	191	161	19	85%	12%
Outpatients	1,181	208	15	18%	7%
Other Hospital	459	184	30	40%	16%
Total Hospital	**5,740**	**4,462**	**2,556**	**78%**	**57%**
Community Healthcare	1,721			0%	0%
Community Prescribing	998	896	100	90%	11%
Other FHS	1,464			0%	0%
Total Territorial Boards	**9,923**	**5,359**	**2,656**	**54%**	**50%**
Social Care	3,116			0%	0%
Total Health & Social Care	**13,039**	**5,359**	**2,656**	**41%**	**50%**
1: R300 & LFR3					
2. PLICS files					
3. HRI analysis					

Figure A1: National High Resource Group analysis 2014–2015

Seventy-eight percent of NHS board hospital expenditure and 90% of community prescribing expenditure was mapped to individual level (note that hospital prescribing is included in hospital expenditure); and 2% of the Scottish population used 50% of the mapped expenditure. This High Resource Group used three quarters of unplanned bed days in that year.

Occupied Bed Days	Scottish Total[1]	Mapped[2] OBDs	HRI[3] OBDs	Mapped OBDs as Proportion of Total %	HRI OBDs as Proportion of Mapped Total %
Planned		976,611	571,072		58.5%
Unplanned		5,611,207	4,316,225		76.9%
Unknown		84,101			0.0%
Total	**6,694,058**	**6,671,918**	**4,887,298**	**99.7%**	**73.3%**

1. SFR5.3
2. PLICS files
3. HRI analysis

Figure A2: Bed Days used by the High Resource Group cohort 2014–2015

As partnerships populate Source with social care, community health and other data at individual level, the scope of the analysis will increase as show in Figure A3 below.

	Partnership Total[1]	Mapped to Individual Level[2]	HRI[3]	Mapped Proportion of Total Expenditure	HRI proportion of Mapped Expenditure
	£000	£000	£000	%	%
Unplanned Inpatients	46,470	46,470	30,484	100%	66%
Elective Inpatients	15,154	15,154	6,215	100%	41%
Other Inpatient	21	21	0	100%	0%
Day Cases	9,432	9,432	2,702	100%	29%
A&E Attendances	2,499	2,499	221	100%	9%
Outpatients	19,847	12,964	1,083	65%	8%
Other Hospital	4,014	3,669	184	91%	5%
Total Hospital	**97,436**	**90,209**	**40,888**	**93%**	**45%**
Community Healthcare	28,942	2,400	931	8%	39%
GP prescribing	18,505	19,231	2,496	104%	13%
Other FHS	23,572	0	n/a	0%	n/a
Total Territorial Boards	**168,455**	**111,841**	**44,314**	**66%**	**40%**
Social Care	57,793	37,865	30,590	66%	81%
Total Health & Social Care	**226,248**	**149,706**	**74,904**	**66%**	**50%**

1: IRF mapping
2. PLICS individual level data
3. HRI analysis

Figure A3: Resource use analysis including Social Care for one Partnership.

Appendix B – Classification matrix

The classification matrix can be used to distribute High Resource Groups into various groupings based on patterns of service usage and clinical and demographic indicators. The matrix can be used to show how a population is distributed but also how costs or activity measures breakdown across these groupings. Figure B1 shows an example of how the High Resource Groups of one GP practice population have been allocated to the different classes within the matrix.

Service Use Matrix

GP Practice Level

Resource Group: All | Age Group: All | SIMD: All | Urban/Rural Index: All | Long Term Conditions: All

Total Cost

	Psychiatry	Geriatric	Maternity	Elective Inpatient	Limited Daycases	Routine Daycase	Single Emergency	Multiple Emergency	A&E	Outpatients	Community Prescribing	Community Care	Residential Care	None
End of Life	-	£767,597	-	£83,350	-	£76,354	£174,549	£893,762	-	-	£55,746	£60,279	£495,012	-
Frailty	£46,804	£2,212,401	-	£240,089	£7,698	-	£410,926	£624,554	-	-	£32,689	£588,886	£2,863,080	-
High Complex Conditions	£63,059	£761	-	£565,298	£95,976	£141,243	£87,750	£334,937	£1,390	£19,655	£206,607	£534,203	£123,910	-
Maternity and Healthy Newborns	-	-	£168,991	-	-	-	-	-	-	-	-	-	-	-
Mental Health	£222,877	£59,140	-	-	-	-	£8,816	£6,758	-	-	-	-	-	-
Substance Misuse	-	-	-	£18,904	£5,919	-	£30,169	£3,191	-	£298	£12,930	-	-	-
Medium Complex Conditions	-	£620	-	£136,302	£49,430	£8,671	£63,834	£49,627	£1,818	£7,104	£93,459	-	-	-
Low Complex Conditions	-	£1,687	-	£347,601	£173,392	£10,594	£215,160	£109,792	£14,167	£53,155	£284,851	-	-	-
Child Major Conditions	-	-	-	£31,810	£17,913	-	£32,582	£8,208	-	-	£8,121	-	-	-
Adult Major Conditions	-	-	-	£92,047	£80,014	£8,962	£129,400	£5,816	-	£5,416	£143,831	-	-	£0
Healthy and Low User	-	-	-	-	-	-	-	-	£50,313	£91,285	£169,341	-	-	£0

Figure B1: Classification matrix showing the distribution of a GP practice High Resource Group population

Appendix C – References

[i] Blumenthal et al. Caring for High-Need, High-Cost Patients-An Urgent Priority; New England Journal of Medicine. http://www.nejm.org/doi/full/10.1056/NEJMp1608511#t=article downloaded 4/8/16.

[ii] Dattalo et al. Targeting Enhanced Services Toward High-Cost, High-Need Medicare Patients;
L.A. Lindquist (ed.), *New Directions in Geriatric Medicine*, Springer International Publishing Switzerland 2016, DOI 10.1007/978-3-319-28137-7_2

[iii] Pan-Canadian Forum on High Users of Health Care: Summary Report; https://secure.cihi.ca/free_products/highusers_summary_report_revised_EN_web.pdf downloaded on 9/8/16.

[iv] Gawande, A. The hot spotters: can we lower medical costs by giving the neediest patients better
care? The New Yorker. 2011 Jan:40-51.

[v] Berwick DM et al. The triple aim: care, health, and cost. Health Affairs (Millwood). 2008;27(3):759–69.

[vi] McCarthy et al. Models of Care for High-Need, High-Cost Patients: An Evidence Synthesis. Commonwealth Fund Issue Brief, Vol. 31, October 2014.

[vii] Mann, C. Targeting Medicaid Super-Utilizers to Decrease Costs and Improve Quality. CMCS information bulletin July 2014; https://www.medicaid.gov/federal-policy-guidance/downloads/cib-07-24-2013.pdf downloaded on 8/8/16.

[viii] Rais,S et al. High cost users of Ontario's healthcare services; Healthcare Policy 9(1), 2014, 44-51.

[ix] Briggs, T et al. Identifying High Users of Healthcare in British Columbia, Alberta and Manitoba. Healthcare Papers 14 (2) 31-6.

[x] Cohen,S . The Concentration and Persistence in the Level of Health Expenditures over Time: Estimates for the U.S. Population, 2009-2010. MEPS Statistical Brief #392. November 2012.

[xi] Calver, J et al. High-cost users of hospital beds in Western Australia: a population-based record linkage study. MJA 2006; 184: 393–397.

[xii] Kozyrskyj A et al. High-Cost Users of Pharmaceuticals: Who Are They? Manitoba centre for Health Policy. http://www.umanitoba.ca/centres/mchp/reports.htm downloaded on 22.8.16

[xiii] Wodchis, WP et al. A 3-year study of high-cost users of health care. CMAJ. http://www.cmaj.ca/content/early/2016/01/11/cmaj.150064 downloaded 16.8.16.

[xiv] Proactively Identifying the High Cost Population. Insights from the Healthcare Transformation Task Force. http://www.hcttf.org/resources-tools-archive/2015/5/14/whitepaper downloaded 4/8/16.

[xv] Hayes, S.L. High-Need, High-Cost Patients: Who Are They and How Do They Use Health Care?
Commonwealth Fund Issue Brief, Vol. 26, August 2016.

[xvi] Salzberg,C.A. Health System Performance for the High-Need Patient: A Look at Access to Care and Patient Care Experiences. Commonwealth Fund Issue Brief, Vol. 27, August 2016

[xvii] The Health System Matrix 6.1: *Understanding the Health Care Needs of the British Columbia Population through Population Segmentation. British Columbia Ministry of Health.* http://www2.gov.bc.ca/assets/gov/health/conducting-health-research/data-access/health_system_matrix_61_definitions.pdf downloaded 23/8/16.

[xviii] Chechulin, Y et al. Predicting patients at risk of becoming High Cost Health Care Users in Ontario (Canada). Healthcare Policy 9 (3), 2014, 68-79.

[xix] Anderson et al. Attributes Common to Programs That Successfully Treat High-Need, High-Cost Individuals. American Journal of Managed Care. 2015;21(11):e597-e600

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