Design Principles for HCBS Case Mix: A Primer
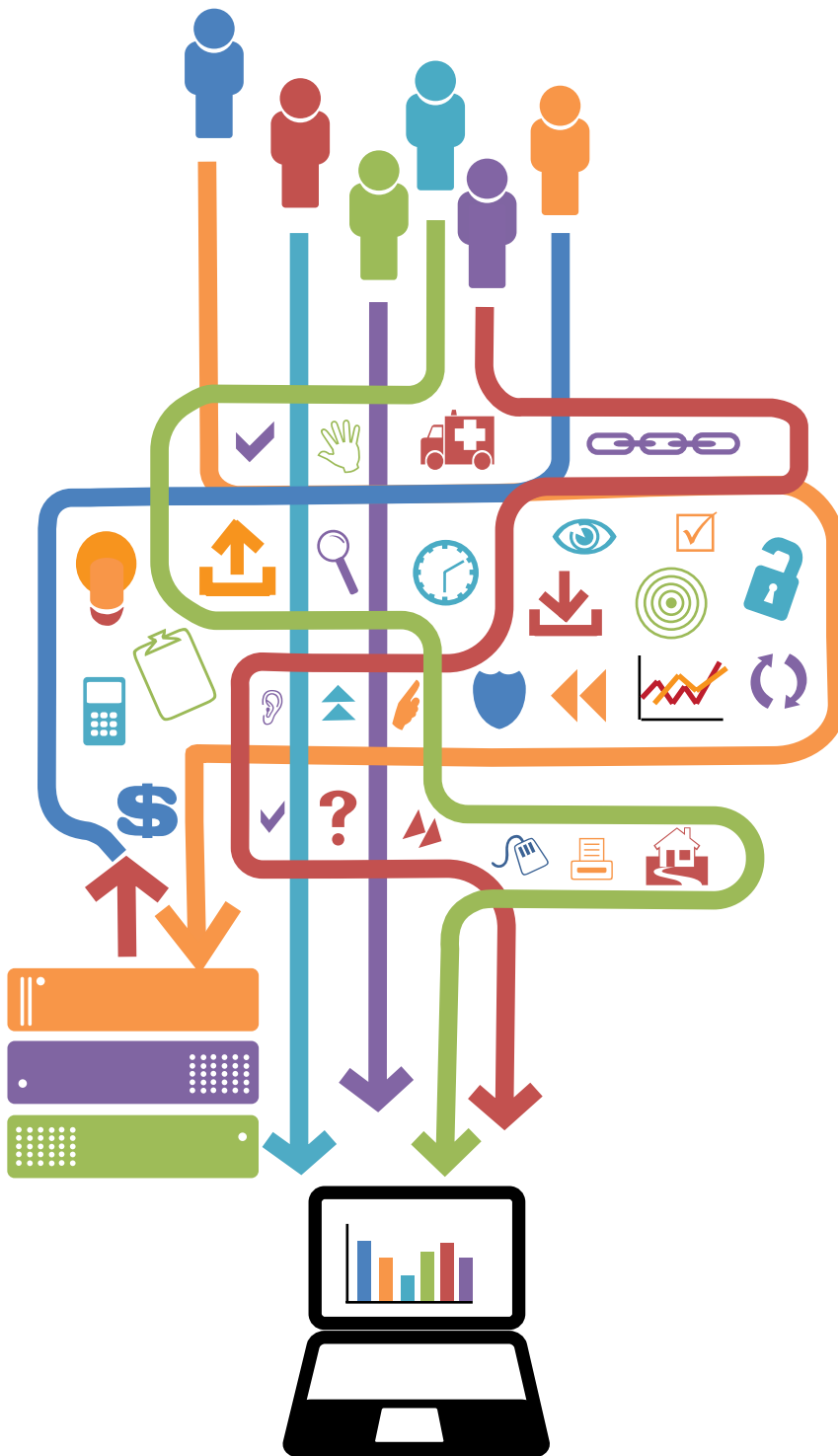
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INTRODUCTION

In 2013, policy makers from five states – Arkansas, Louisiana, Maryland, Michigan, and Missouri – partnered with researchers at the University of Michigan to study existing state HCBS case mix approaches. This report is one of the products of that collaboration. It will present background information on different HCBS case mix approaches, the steps in the development of a case-mix resource allocation system, essential decision points to consider during the state policy development process, and best practice recommendations.

Why Case Mix is Important

Since the first 1915(c) waivers were introduced in the early 1980s, Home and Community-Based Services (HCBS) have become an essential component of the American long-term care system. Today, most states offer one or more HCBS waiver programs, and many also offer home health and personal care services through their Medicaid state plan. While the cost-benefit of HCBS programs is generally well-accepted, states have faced challenges as they initiate efforts to coordinate the allocation of HCBS resources across these multiple services and support options. This problem is especially complicated within the constraints of fee-for-service payment, but managed care payment approaches do not by themselves automatically result in allocation strategies that are responsive to the heterogeneous needs of the HCBS population.

Case mix, an approach to resource allocation that systematically considers the relationship between a person's characteristics and the cost of that person's care, offers an alternative strategy. A number of states have experimented with case mix approaches to HCBS resource allocation and payment, in hope that such approaches can support larger cost containment efforts, promote fairness in allocation, and forge a stronger link between individual needs and the amount of services and supports received.

How to Use the Primer

This guidebook is intended as an introduction to HCBS case mix. Because of the variety and complexity of different state systems, it cannot comprehensively cover all aspects of system design. Rather, it is presented as a tool to help policy makers, state staff, and stakeholders understand and become comfortable with the basic tenets of case mix. We encourage states interested in case mix to reach out to other experienced states and organizations for additional guidance as needed.

Basic case-mix concepts and approaches to case-mix system design are introduced in Section I. Section II discusses the steps in developing a HCBS case-mix system, using one possible model as an illustration. Using the system to calculate expected service levels and make resource allocation decisions is covered in Section III. Section IV gives an overview of implementation and Section V covers several "great issues" in HCBS case mix.

I. BACKGROUND AND BASICS

Definitions

We have found it impossible to discuss case mix without employing some specialized terminology:

Acuity: In medical settings, acuity is defined as the degree of severity of an illness or condition. In LTSS, acuity is often most closely associated with a person's need for assistance in Activities of Daily Living (ADLs), such as personal hygiene, toilet transfer, locomotion, and eating, and IADLs, including money management, medication management, housekeeping, and meal preparation. Cognition, disease burden, and specialized treatments or procedures may also be used to measure acuity among LTSS users. Regardless of setting, people with higher acuity typically use more care resources, while those with lower acuity use less.

Allocation: The amount of resources to be provided to a group of persons with similar characteristics. Allocations may be expressed as dollars (e.g., a per diem of $67.87 for a person in Group X) or as hours (e.g., 5.7 hours of care daily for a person in Group X). An allocation may be expressed as a ceiling amount, a range, or an average amount of care.

Case mix (CM): An approach that identifies individuals based upon a set of clinical characteristics that are demonstrated to be related to their actual costs of services/supports. Most case-mix systems classify individuals into groups that have similar characteristics but are clinically distinct from one another; within a given group, individuals would also use similar amounts of assistance.

Case mix index (CMI): A ratio that expresses the relative average amount of care associated with a given case mix group, compared to the average amount of care across all users. For example, if the average acuity of a HCBS population is 1.00, and a particular group uses on average 20% more resources, this group would have a CMI of 1.2. Expressed in dollars, if the average payment for that population is $100/day, the sub-group with a CMI of 1.2 would have an average payment of $120/day. Expressed in hours, if the average number of hours used by the population is 4.3 hours/day, the group with a CMI of 1.2 would have an average use of 5.16 hours/day.

Case-mix allocation systems: The scientific and administrative methods used to link a given amount of resource use to particular characteristics of the individual that are believed to best represent the "need" for care. Successful case-mix systems have been developed for hospitals, nursing homes, home health care, and inpatient psychiatric care, each with its own complexities. Case-mix systems may be informed by legislative intent, analysis of historical expenditures, expert opinion from clinicians or advocates, statistical analysis of the clinical characteristics of users, or a mix of these information sources.

Fee-for-service (FFS): A payment approach characterized by paying providers for whatever units of care are rendered. This is often conflated with resource allocation approaches that are not acuity-based. In this report, we occasionally use the term "typical fee-for-service" to denote non-acuity-based resource allocation. However, contrary to FFS, care in a case-mix system, whether reimbursed on a per-unit basis or on a fixed basis, is calibrated against case mix-based measures or limits.

Home and Community-Based Services (HCBS): A range of assistance provided to individuals in their home or other community setting to address long-term care needs. In the United States, HCBS may include both hands-on care (e.g., personal assistance services) and ancillary support services (e.g., home-delivered meals, employment supports, education supports). HCBS are used by various populations, including children with special health care needs, persons with developmental disabilities, and persons with behavioral health or substance use disorders. In this report, we focus on HCBS for aging individuals and adults with physical disabilities, although the constructs are applicable to other LTSS populations.

Long-term Services and Supports (LTSS): Assistance provided to individuals with long-term care needs. LTSS includes both HCBS and facility-based long-term care (e.g., nursing home, adult family homes, or assisted living settings).

Resource use: The services and supports that people actually use to address their needs. In HCBS, resource use may embrace formal (paid) services only, or include informal (unpaid) care, as well.

Variance explanation: A statistical measure that demonstrates how much of the difference in resource use is explained by the case-mix system.

Benefits of Case Mix

The application of case mix is broad. It can help policymakers, advocates, and clinicians alike to:

- Discern more clearly the many different types of care needs among people seeking LTSS assistance

- Move away from a "one size fits all" funding approach to more creative, individualized support opportunities and arrangements

- Prioritize among service seekers

- Guide service allocation practices to promote more equitable decision-making by care managers

- Rationalize historically inconsistent allocation policies

- Coordinate across a state's multiple, often overlapping, HCBS funding streams

- Enable risk adjusted comparisons of provider/program quality outcomes and practice patterns

- In times of budget change, identify specific groups of service users for expanded assistance or cuts, instead of spreading increases or decreases across all acuity groups, which tends to penalize high acuity individuals

> Louisiana's implementation of case mix enabled the state to reduce overall service costs, without disproportionately affecting higher needs individuals. This brought its waiver back into CMS compliance by reducing average per-person HCBS expenditures below those of individuals in nursing homes.

Basic Case Mix Principles

Case-mix "systems" are comprised of two different elements: Case mix has both a measurement component and a resource allocation (payment) component. It is critical to distinguish between these two elements. The scientific measurement and classification of resource use in a population will be discussed in Section II. While the science provides an objective foundation for resource allocation, developing a payment system includes many policy considerations beyond the case-mix classification system itself. These issues will be discussed in Section III.

A goal of case mix is a scientifically sound and data-driven system: The primary difference between typical fee-for-service and case-mix resource allocation is that amounts of care are allocated scientifically, based upon measured acuity. This is in contrast to approaches that rely heavily upon opinion or arbitrary formulas, for example, capping service costs at x% of the average statewide nursing facility expenditure.

Case mix measures what is, not what should/could be: Case-mix systems aim to predict "usual" care, rather than what a person could or should receive in services. Case mix cannot resolve the problems inherent in an inadequately funded HCBS system, nor can it identify the ideal amount of care needed to produce the best possible outcome for each person.

States have a "make or buy" choice regarding case mix: Derivation of a unique, one of a kind case-mix system allows a state to specify what characteristics of HCBS users are most important based on its particular policies. For example, if policy makers in a state are very concerned about rising numbers of individuals with traumatic brain injury, they may choose to include this as a characteristic that determines case-mix group. While a state can undertake independent derivation of a case-mix system, there are also existing, research-based HCBS case-mix models that states may consider. Building on previous work, especially from large studies with multiple validations, can save states considerable effort and money, and can avoid idiosyncratic findings that can happen when only small amounts of data are available. States adopting existing models can use their own historical utilization patterns (e.g., usage as reflected in claims) to derive CMIs, as CMIs may differ from state to state. Alternatively, states may validate the groupings using historical utilization, and then adopt research-based CMIs. This decision is considered in more depth in the Section II.

HCBS costs vary across people for a variety of reasons: These reasons may be internal to the individual and the family, or variation may reflect environmental factors or provider issues. Internal causes of variation can include true differences in assessed need (e.g., needing help in housework versus hands-on assistance with transferring), differences in personal preference (e.g., preferring to receive less or different care than offered), differences in outside help (e.g., having an informal caregiver who provides assistance), and differences in self-advocacy (e.g., repeated requests for additional funding). These person-level characteristics may influence the level of services authorized at the time of the plan of care or later. External factors that can influence variation include provider or care planner practice patterns (e.g., regularly providing a "standard package" to all clients during a visit, regardless of individual's clinical characteristics), provider scheduling, regional location and remoteness, wage differences affecting the amount of care

received for a given financial allocation, and inadequate oversight of care managers/assessors to monitor and assure consistency in resource allocation decisions. Provider characteristics would provide greater variation in cost of care in states where rates vary widely between providers.

Criteria for Selecting a Case-Mix System

A robust system will meet statistical, clinical, and administrative criteria, as outlined below.

Statistical measures

Variance explanation is a statistical measure that reflects the degree to which differences in resource use are explained by the case-mix system. A relatively high variance explanation suggests that the case-mix system would do a good job at determining the appropriate amount of resources that an individual will use. Because variance in cost may be influenced by so many factors outside of acuity, one cannot expect too high of a variance explanation. The case mix classifications for nursing facilities that were developed in the original 1985 RUG study had a variance explanation of 38%, which was considered very good. Subsequent iterations of RUG achieved even higher variance explanations. There is no common agreement on what is an acceptable variance explanation.

Very large variance explanation claims deserve further scrutiny. For example, a report on derivation of a six level resource allocation approach using the Supports Intensity Scale (SIS) reported an overall variance explanation of 45.6%. However, the amount of variance explanation attributed to differences in individual characteristics (e.g., behavior, functionality, medical condition, etc.) was 15.6%, while living arrangement (living independently "on one's own" versus living with parents or other family) accounted for 30% of the variance explanation. Because people who live independently had nearly two times the total annual costs as did the people who lived with family, this treatment of residence tangled service costs (the dependent variable) with the characteristics of the individuals receiving services (independent variables).[1]

A very low variance explanation might suggest that the system would not predict use well, and that using the system for resource allocation may lead to some individuals getting too much or too little care. A system's variance explanation will be decreased when elements are present that confuse the relationship between an individual's measured acuity and his/her service use. Specifically, these elements may include:

- Non-adjacent assessment and costs: If the individual's status changes and a different care plan is put in place without a new assessment, the costs could change while the assessment information would not

- Unresponsive care plans: Care planning policies, such as limits on the daily or monthly amount that can be spent on an individual, restrain the amount of care that can be provided and will lower variance explanation

- Differences in service use or costs that are not associated with the recipient's acuity: regional wage differences; agency care planning practice patterns; regional rate differences

- Limited availability of certain services in a particular geographic region

- Individual or family preferences that affect the amount or type of care used

- Rare types of individuals: If the sample has only a few persons of a particular type with, say, an extremely high cost, then it is not possible statistically to identify them for a case-mix group

- Unmeasured characteristics: No matter how complete an assessment, there can be characteristics of the individual that are not captured that may affect the amount of care received

- Unknown effect of natural supports/informal care or other outside help on formal care provision

- Reliability: Any measure in an assessment system that has less than perfect reliability will reduce variance explanation; it is worth noting that all assessment measures have less than perfect reliability!

- Agency characteristics: Individual agencies may have practice patterns that are independent of participant acuity and need

Other statistical criteria include measures of homogeneity of the final groups, as measured by their coefficient of variation (the group standard deviation divided by the group mean). This statistic calculates the percentage of the people within a case mix group whose costs were at the mean. Statistical measures of differences between group means may be utilized to ensure that differences in resource utilization are meaningful. Preference should be given to systems which demonstrate good statistical properties not only in the derivation, but also in independent validation.

Clinical measures

A case mix system needs to make clinical sense as well as to display adequate statistical strength. "Clinical sense" means that individuals within a given group look similar to one another (e.g., have similar ADL needs and similar behavior) and that there are recognizable differences (e.g., degree of ADL limitation, presence of medical conditions requiring frequent monitoring by a

nurse) between the groups. Ideally, case-mix groupings enable stakeholders to "visualize" the characteristics defining the groups within a system and to understand the logic that places people in a given group. However, heavy reliance upon stakeholder opinion may undermine the scientific foundation of the system. Objectively quantifying the measures helps insure that they are scientifically sound.

Administrative criteria

Measures should include individual characteristics that can reliably be assessed or audited and are not subject to easy "gaming." This will also reduce the possibility of case mix "creep" (when individuals are classified into higher acuity groups over time, even without substantial change on the part of individuals). Additionally, the measures should provide incentives for appropriate care and avoid perverse incentives. For example, including the use of a catheter as a measure that determines case mix might create a perverse incentive to catheterize individuals who may not have a legitimate need. Finally, a balance needs to be drawn between simplicity and complexity. A system with only a few groups or only utilizing a few variables will be easily understood, but is not necessarily superior to a system with multiple groups that uses many personal characteristics. Determination of case mix will usually be accomplished by computer calculations, so it is feasible to employ a more complicated yet sensitive system. We consider these issues further in Section II.

Approaches to Case-Mix System Development

Two basic approaches to classification have been used to create HCBS case mix systems: point systems and grouping systems.

Point systems use a person's characteristics or circumstances to add "points" or specific care times to a total score. Point systems generally start with a list of possible characteristics or "needs" that a person may exhibit (e.g., help bathing, help preparing meals, person uses ventilator). Points are added to the individual's score for each characteristic or needed task. Finally, points are summed and a corresponding budget, service package, or amount of time is assigned to the individual. Such approaches are sometimes called "index systems"; here, we refer to them as "point systems" to avoid any confusion with other case mix terms.
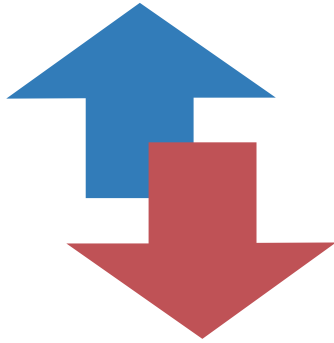
Advantages: Point systems are generally simple to use and easily understood by participants and stakeholders.

Disadvantages: If a range of points or minutes is allowed, there may be little difference between the resulting system and non-acuity-based allocation (e.g., if the range is very large, care may be allocated without close consideration of the case-mix structure). If a range is not allowed, the system may not adequately consider individual variation, and may underestimate total care time (e.g., bathing a person who manifests aggressive behavior can take substantially longer than the "average" bath). Additionally, point systems may poorly represent shared tasks, such as when an aide prepares a meal while also tidying the kitchen and providing some degree of oversight to the person. This may result in double-or triple-counting the time "needed".

The Arizona "HCBS Member Needs Assessment" is an example of a time-based point system. A case manager determines what activities an individual requires help with from a set list of Activities of Daily Living and Instrumental Activities of Daily Living. The individual's level of impairment in completing a given task maps to a suggested range of minutes (e.g., a need for minimal help with bathing contributes 1-15 minutes per day; help with laundry off-site contributes 1-120 minutes per week). The case manager uses professional judgment to determine the specific number of minutes needed per task per day, then sums the total minutes expected throughout the week.

Grouping systems use personal characteristics to assign each individual to a unique group. Each group will have similar characteristics and similar resource usage patterns. These systems conceptually follow categorization approaches often seen in biology and medicine. To form such a classification system, a measure of resource consumption is chosen. Then groups of similar individuals are developed using analysis of variance, cluster analysis, or Automatic Interactions Detection. Each resulting group is differentiated by clinical characteristics, but has similar values of the dependent variable (resource use).
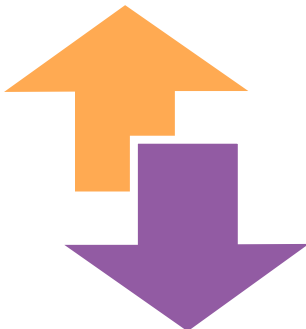
Advantages: Grouping systems better measure multiple, interacting characteristics, and can identify recognizable "types" of individuals.

Disadvantages: Scientifically creating and validating grouping systems can be a complicated endeavor, requiring large datasets and extensive statistical work.

Measuring HCBS Resource Use

The amount of assistance that individuals use can be characterized in a variety of ways, including time studies, past service expenditures, or "best guess" estimates.

Time-and-motion studies, known more commonly as time studies, meticulously record caregiver activities over a standard timeframe. Activities and time may be recorded by independent observers, or based upon staff or informal caregiver self-report. The most well-known time study in LTSS is the National Staff Time and Resource Intensity Verification (STRIVE) Project, refining the Resource Utilization Groups (currently RUG-IV) system for the Medicare Nursing Home Prospective Payment System. This project spent over $7M just to collect staff care times for nursing home residents and took over four years to complete. Such studies are expensive and thus have to date been out of scope for state HCBS programs. In addition, they are most essential when it is difficult to quantify the amount of time caring for a single individual, which is often the case within residential or institutional facilities, but less of an issue in HCBS.

Historical utilization data, typically adjudicated claims, give a clear picture of the paid care that participants have received and provide a direct measurement of everyday practice. This will ensure the resulting system does not inflate anticipated care needs, but more accurately represents what is normally given and adequate. These data are generally available to states and present few barriers to their use. The programs and cost centers to include in analysis is an important decision, and will determine the breadth of the resulting case-mix system. These issues are covered in more depth in Section II.
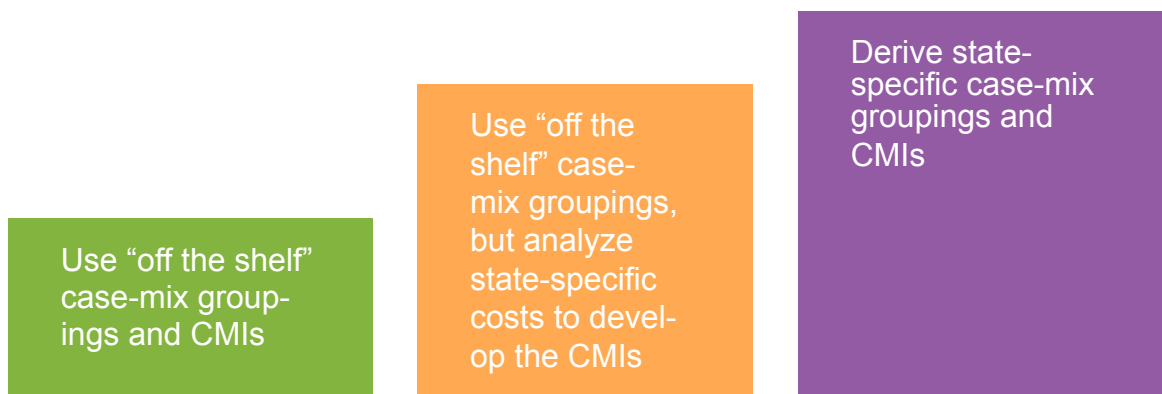
 "Best-guess" estimates typically measure costs as an aggregate of task-related services. Estimates start with a standard set of "average" times associated with everyday tasks, for instance, 15 minutes to do laundry, and then individual task times are summed to create a measure of the individual's total expected resource use.

II. DEVELOPING A HCBS GROUPING CASE-MIX SYSTEM USING HISTORICAL UTILIZATION

In general, the development of case-mix measurement systems requires two sets of information: a measure of the resources provided to a sample of individuals over some fixed period of time (e.g., a week, or month, or year), and a broad set of characteristics describing the individuals in the sample within the same time. In order to illustrate this process, in this section we focus on the development of a case mix grouping system using historical utilization data to characterize resource use. Using such a system for resource allocation will be covered in Section III.

Adopt or Derive?
States need to decide how much effort they wish to invest to develop a state-specific case-mix system. These include the following options, in order of increasing effort:

Use "off the shelf" case-mix group-ings and CMIs	Use "off the shelf" case-mix groupings, but analyze state-specific costs to develop the CMIs	Derive state-specific case-mix groupings and CMIs

These are all valid approaches. While every state is unique in the types, frequency, and cost of its services, a case-mix system from elsewhere may well apply accurately, as such systems are rooted in the type of individual served, not the prevalence of each type of person. Also, case-mix systems measure relative use of resources, so using a system derived elsewhere in a more or less resource-intense state enables that state to apply these relative measures to the state's funding pool and stay within budget. In general, validation work to date has shown a remarkable comparability of case-mix systems across jurisdictions. For example, in nursing homes, the RUG-III system, derived in US nursing homes, has been validated over nine times, in different countries with diverse health care systems.

States interested in using "off-the-shelf" groupings or CMIs can test how well they will work by using matched claims and assessment data to calculate the variance explanations of the candi-

date systems. A high variance explanation would indicate that the candidate system more closely mirrors the state's existing allocation system. The articles listed in the resource appendix include more information about calculating and comparing variance explanations.

The general process outlined in this section can be followed for any of the approaches outlined above. Given the growing use of statewide, standardized assessment data across multiple programs, the availability of robust claims data, and research-defined clinical groupings of "like" individuals, development of a HCBS case mix payment system is within reach for states interested in making their reimbursement practices more reflective of individuals' needs.

Step 1: Select and implement standardized assessment	Step 2: Analyze assessment and utilization paterns	Step 3: Adopt or develop groupings	Step 4: Calculate case mix weights / CMI
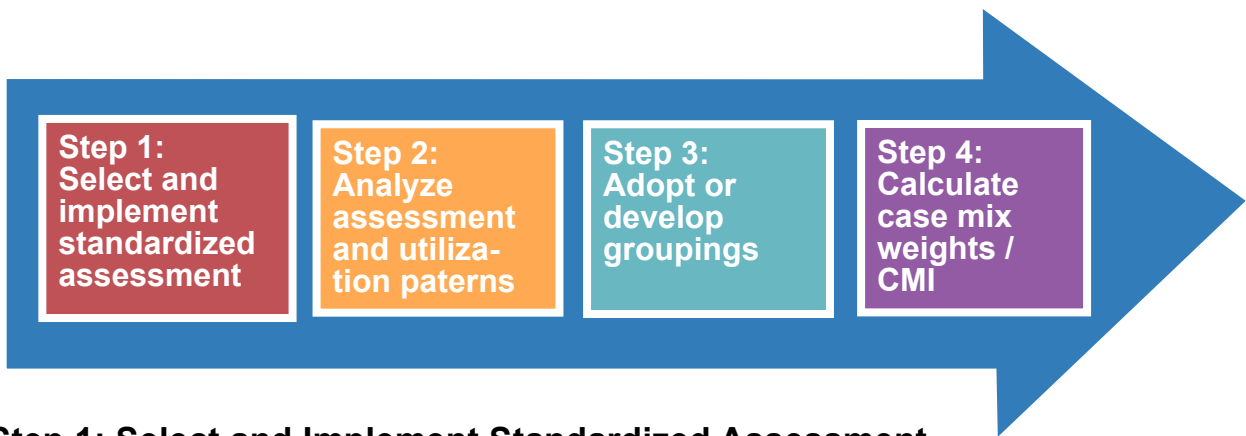
Step 1: Select and Implement Standardized Assessment

Standardized assessment is the first key component of a case-mix system.

Ideally, the assessment used to determine a person's resource level also serves multiple purposes beyond resource allocation. Specifically, standardized assessments can support program and policy efforts by:

- Facilitating effective care planning and coordination to improve the client experience. Assessments which have embedded scales and risk markers can highlight areas of concern for the individual.

- Allowing for straight-forward and consistent monitoring of eligibility criteria and resource allocation procedures, ensuring that state and federal policy are adhered to and resources responsibly managed.

- Allowing comparison across populations and settings. If an assessment system includes items that have been demonstrated to be valid and reliable across populations and/or service settings, the resulting data can identify needs and concerns that are shared across populations, and can be used to compare and contrast populations for the purpose of differential policy projection analyses. Cross-walked instruments that are only similar in content do not allow the same precise comparisons to be made.

- Allowing states to consider more effectively the unique needs of different populations. In turn, this allows states to understand better their consumer populations and more effectively plan and monitor policy changes.

Collecting data once and using it for many purposes also shields the person from multiple and redundant questioning, a process that is fatiguing for people of limited stamina, as well as invasive and time-consuming. Finally, when assessment information is collected solely for the purpose of case-mix payment, there are strong incentives to "up-code" items associated with higher payment; using a system for multiple purposes provides offsetting incentives, such as "down-coding" to minimize reporting of negative quality of care measures.

Available HCBS assessments

States may choose to develop an assessment themselves, or to adopt an existing assessment. State-developed, "homegrown" assessments are often designed to mirror state-specific LOC requirements and other local policy concerns. As assessment design presents a variety of technical challenges, adopting an appropriately researched assessment has major advantages in terms of completeness, validity, reliability, and comparison across states and populations, and simplifies the logistical hurdles that accompany moving to case-mix resource allocation.

The federal Balancing Incentive Program (BIP) required states to adopt a core standardized assessment instrument. Of the 20 BIP states, nine adopted the interRAI-Home Care tool (www.interrai.org) for their elderly and physically disabled populations; two adopted other interRAI tools (the MDS-HC and the interRAI Community Health Assessment); nine developed their own state-specific assessments. Outside of BIP, nine other states have also chosen to adopt an interRAI tool for one or more target populations in their waiver programs.

Characteristics of a good assessment system

Given the importance of appropriate resource allocation as well as the multiple roles that an assessment may play, selecting a good assessment is essential. A good assessment system will be:

> **Reliable**
> The instrument's results should be consistent and replicable, so that if an individual is assessed multiple times (assuming no actual change on the individual's part), the assessment will consistently produce similar results. Reliability may refer to test-retest reliability (consistency from one time to another) or inter-rater reliability (consistency from one assessor to another).

Valid

The instrument's items should accurately measure what they are supposed to measure. There are various types of validity that can be considered, including, for example:

• Face validity – Based upon experience and best judgment of experts, advocates, or stakeholders, the instrument appears to be relevant and correct.
• Convergent validity – Items in the assessment statistically correlate with other established, accepted measures or tests, indicating that the assessment evaluates similar characteristics in the same way.
• Predictive validity – Items or groups of items are statistically associated with selected measurable outcomes, indicating that they can accurately predict those outcomes.

Sensitive

The assessment should be sensitive enough to detect differences of importance across the target population; thus, individual items should have a sufficient range of responses. If the number or range of responses is limited, then many disparate individuals may be lumped together, and important differences between these individuals may not be clear. More granular response options allow differentiation between these individuals. Well-constructed assessment items will have sufficient response options to allow clear categorization and clinical meaning, while not overwhelming assessors with unnecessarily lengthy response choices.

Logistically feasible

The assessment system needs to fit the purpose and be responsive to state-specific practical or logistic requirements. A state must consider the resources/time that will be required to complete the assessments relative to its potentially several applications beyond case-mix measurement, and also recognize that when a good assessment system is implemented, other "legacy" assessments often can be dropped. Other considerations include the assessment burden for the person and the impact of assessment errors.

Assessment sample

Any group of people that a state wishes to include in future case-mix resource allocation should be assessed (for instance, aging or disabled persons enrolled in a 1915(c) waiver). It is very important to include all types of individuals, including those who may be considered outliers, in the sample.

Assessor qualifications

Assessors should be familiar with common concerns and needs of the population that they assess, well-acquainted with the item definitions and coding structures used in the assessment, competent in the use of any software, and possess demonstrated assessment competencies, including cultural competence, respect, empathy, interviewing skills, observation skills, and patience.

Oversight

While clinical judgment can be improved through training and supervision, coding errors can occur among the most experienced assessors. As well, some assessors may purposefully up-code or down-code client characteristics. Quality assurance strategies can identify problematic assessment practices on both an individual and agency basis. Random assessment reviews – that is, another assessor revisiting the individual shortly after the first assessor to examine agreement between the two assessments – have been instituted by some states with success. Algorithms may be developed to flag unlikely response patterns, such as individuals assessed as needing significant assistance with IADLs such as managing medications or finances, yet retaining cognitive abilities, or to identify a pattern of assessor ratings that indicate purposeful up-coding. Regardless of the method for identifying inconsistencies, assessors should be held responsible for the accuracy of the data they collect.

Assessment frequency

CMS requires that HCBS waiver participants have their plans of care reviewed at least annually. The breadth of this review can vary, but often includes a full reassessment. For case mix, it is important that reassessments be administered whenever an individual's acuity changes significantly, so that resource allocation can be adjusted appropriately. States need to guard against reassessment for case-mix measurement being performed only when a person increases in acuity; with appropriate care, some people can and do regain function and become less dependent on paid supports.

IT requirements

A strong IT infrastructure is an essential partner to a case-mix system. Specific IT requirements vary by assessment system and state. The design process is often complicated for states that

wish to use comprehensive assessments to fulfill multiple purposes such as level of care, ongoing care management, and case mix reimbursement. In such instances, it is likely that the state will need to involve staff from different agencies or divisions in testing, especially if the software system is expected to run sophisticated categorization algorithms. The software development process can be lengthy and costly, and there is great variation in the quality and user-friendliness of end products. States are encouraged to talk directly to multiple references before selecting a software vendor.

Step 2: Analyze Assessment and Utilization Patterns

The most time-consuming step in case-mix system development is data collection. After the selection and adoption of a standardized assessment, the state must collect sufficient assessment data. As individuals are assessed, enter the program and begin to receive benefits, paid claims data will provide the second piece of key information that must be linked with assessments to characterize both the population's acuity and its resource use.

Amount of data needed

The number of individuals in the sample depends upon the number of groups envisioned and the expected or desired heterogeneity of resource use. Developing a very discriminating system, which may have a large number of groups or groups with very varied clinical characteristics but only minor differences in resource use, would require a larger number of observations. For a reasonably robust system, our experience has been that such analysis requires at least a couple of thousand observations; this can be easily accomplished in some settings and is very complex in others, as described below.

Representativeness of data

Case-mix analysis does not require a statistically representative sample. The primary need is for the sample to have all the different "kinds" of individuals present in a population, with non-trivial frequencies. In fact, there is some advantage to a sample that has a higher frequency of "rare" individuals, usually those with higher costs; such a bias allows analysis of those individuals in greater depth. Without adequate representation, people with unique or unusual characteristics will be lumped in with other groups with dissimilar resource usage, leading to a poorer match between the person's need and the assigned resources, and an overall decrease in variance explanation. If, however, the sample over-represents a limited number of types of individuals, the variation that can be explained is decreased.

It should be noted that the development of the resource allocation system will almost always require at some point a representative sample, so that the overall case-mix of the target population

can be determined and related to the overall budget. Development of the sample depends upon the setting. For persons using HCBS, where care is typically provided on a discrete per-visit basis, a "convenience sample" can be used, such as all visits by selected care agencies (e.g., in a geographic area) over a number of months. States which have already implemented an assessment system statewide, however, may choose to collect data on the full population of individuals – always a safe option.

Choice of cost centers or service types

Choosing what payment data to include in analysis hinges on one critical question: What services do you want to allocate based upon case mix? The answer to this question will vary state to state and will be partially dependent upon political and practical considerations.

One important consideration is that including unusual, one-time, episodic, or rarely used services (and especially expensive ones, such as home modifications) will create a system where access is more difficult for individuals who would otherwise use that service, while other individuals are allocated a nominal amount needlessly. To identify unusual services, it may be useful to review past CMS 372 reports or to examine memoranda of understanding to identify services used by a small minority of enrollees. Allocating such services on a case-mix basis would not provide resources sufficient for those who would normally use the service to be able to take advantage of it.

Rare and costly services present a problem even if a state is paying a provider or agency to care for a group of home care participants. In the above example, agencies would receive the $60 for each person they care for, and pay the large cost of environmental modifications for the rare

> As an example, consider a home care program with a population of 10,000. Historically, in a given year, 200 individuals receive a home modification, at an average cost of $3,000 (a total cost of $600,000). If this cost were included in a case-mix system, it would be spread across the entire population, with a projected annual allocation of $60 per person ($600,000/10,000), or around sixteen cents a day. This would be an unnecessary and wasted allocation for the vast majority individuals not in need of the service, and would be far too meager for the people who do need a home modification.

people using the service. If a provider was not serving a sufficiently large number of recipients – in this case, 50 people – they would not have enough funding provided to cover even the cost of one average home modification. The agency would be disadvantaged and every other agency would get a (small) windfall profit. Therefore, in general, it is best to exclude these types of costs from a case-mix system, and instead handle them as fee-for-service payments or as a statewide pool.

Many states provide HCBS services within the state Medicaid system through multiple

funding streams that essentially offer the same services to the same types of people; however, such services may have different eligibility and allocation limits. Because federal rules require that state plan funds be used before waiver funds are tapped, some states have individuals that receive a variety of "personal assistance services" through both sources. It is critical to identify program overlap for each person in the sample. This will enable policymakers to evaluate whether this complicates case-mix policy design and to test the impact of any such subgroups in the case mix analysis. For states that have essentially equivalent services supplied through both state plan and waiver funding streams, case mix would be expected to predict the combined care from both sources better than it predicts service levels of each funding source separately.

States most often choose to case-mix adjust a service package that includes hands-on, attendant care-type services that address ADL needs. Because the case-mix budget is an overall guide for cost or hours of care, services that are included are treated as interchangeable in terms of meeting an individual's resource needs. For example, consider a system that includes personal care, home-delivered meals, and homemaker services. If an individual is allocated $1,000 monthly, the system's structure allows that money to be spent freely among the three types of services. While services may remain separate in definition and provider types, they will be compared to the case-mix adjusted budget as a summed package. In the previous example, it might be reported to the state that the individual used $600 for personal care, $200 for meals, and $200 for homemaker services; however, the summed package, $1,000, is the relevant amount that would be compared to the allowable allocation.

Considerations around self-directed care

Questions often arise about case mix for individuals who are self-directing their care. Because case mix seeks to assign resources based upon individuals' characteristics, rather than provider characteristics, case-mix payment can certainly be applied to this group of individuals. However, states should consider whether differences between the current allocation practices for self-directed and traditional agency models could affect future case-mix system development. States whose current allocation procedures are unit-based – that is, where an individual is assessed and allocated a number of hours or service units, agnostic of delivery model – may not see significant differences between self-directed and non-self-directed populations in historic utilization of hours of service rendered, but they may see significant differences in total expenditures, since self-directed care is typically reimbursed at a lower rate. Similarly, states that have previously allocated resources in terms of a dollar budget, enabling self-directed individuals at a given acuity level to purchase a greater number of service units than others at the same acuity level, would likely see few differences between groups in terms of total expenditures, but would see

that self-directed individuals have more hours of service than non-self-directed individuals. Such mismatches could reduce a system's variance explanation unless thoughtfully considered.

Necessary data elements

Assessment data: At a minimum, it is necessary to have an assessment dataset that includes a wide range of characteristics to define the case-mix groups. Pruning assessment data back to a very minimum number of elements is not advised, as the proposed system may be subject to stakeholder criticism or outright rejection if the elements used to classify individuals are perceived as incomplete. Opinions differ on whether and how to incorporate informal care (unpaid care provided by family members, friends, and neighbors), which often substitutes directly for formal care and may comprise a substantial portion of a person's LTSS care plan. See Section V for a more thorough discussion of informal care.

Expenditures: It is essential to use expenditure data that are considered complete by stakeholders and the analytic team. Because bills and pending claims may not match final allowable amounts, it is advisable to use only adjudicated paid claims (i.e., final paid amount after any adjustments). Under Medicaid, providers normally have 12 months to submit claims. Depending on how quickly claims are submitted and processed, states may need to wait as much as a full year to consider resource use data complete and reliable by all stakeholders.

Generally, the time frame used to calculate the average per diem utilization for each person should go forward from the date of the assessment. If the state links claims data forward from the assessment date, the look-forward period should be sufficient to account for any disruptions in service usage that are associated with starting new services, changing providers, or smoothing out informal care arrangements. Analyzing expenditure patterns for new and established clients separately (and then later seeking to discover the policy or practice-based causes of these differences) could help make such differences apparent.

Depending on program structure and resource allocation intentions, it may be preferable to use total paid dollar amount, number of units or hours, or a combination, as the resource measure to be predicted by the case mix system. If a state intends to include services with different fee structures in its case mix, and does not want to disadvantage one service over another, modeling based upon number of units might be preferable. Additionally, if rates differ and previous care planning has been based on units rather than dollars, using total paid dollar amount may decrease the variance explanation. However, if overall budgetary control is more of a concern and the state is not concerned about differential value of services, using total paid dollar amount may be preferable.

It is routine to find outliers during analysis – individuals who use an unusually high or unusually low amount of service. The first step to deal with outliers is to determine whether the observations appear to be real. Are the amounts of resources impossible (e.g., 30 hours in a day)? Did analytic procedures incorrectly truncate data or include/exclude data points that were not intended? Were there any matching or merging errors? Could a systems error (e.g., manual data entry) be to blame? Once incorrect outliers are eliminated, the remaining ones can be considered "real" and included in the analysis. However, it is wise to check if a high outlier is the sole cause of a relatively rare group being identified or an extremely high CMI being assigned to a group.

Identifiers: Both assessment and claims datasets must have adequate identifiers to link them. These identifiers may include social security number, Medicaid ID, date of birth, and other state-assigned unique identifiers. Including multiple identifiers will help minimize matching problems.

Step 3: Adopt or Develop Groupings

Some states, such as Minnesota and Washington, have opted to create their own unique case-mix groupings. There are significant advantages to using an existing system that has been validated and has a strong scientific foundation. One such system is the Resource Utilization Groups Home Care Classification (RUG-III/HC), which uses 73 items from the interRAI-HC assessment to assign individuals into 23 groups. Whether a state wishes to evaluate an existing grouping system or wants to create its own, it is important to understand the principles underlying case-mix classification.

Assessing the quality of the proposed case-mix classification

At their most basic, case-mix groups are comprised of individuals with similar resource usage, as measured by variance explanation. This single number provides a useful, easy yardstick. However, several criteria besides variance explanation need to be considered:

- Adequate number of sample observations in each resulting subgroup. Although there is no specific minimum group size, it is best when there are at least 20 observations in a group. When deriving a case-mix system based on very small sample sizes, smaller group sizes may be tolerated if the group makes sense clinically

- Statistical significance as well as substantiality of the difference between the resulting subgroups

- Clinical opinions of the importance of the characteristics considered in grouping definitions

- Validity and reliability of the assessment measures that define the groups

- Whether included characteristics would provide inappropriate incentives. Some characteristics of the individual can be good predictors of high cost, but could provide incentives for poor care. An example of this is control interventions; including such a variable in a case-mix system would encourage their greater use

- Whether included characteristics are based on the individual or a reflection of services received. Defining groups based on service use may provide incentives for over-provision, and could be dependent upon variables outside of the individual (e.g., environment or provider practices, such as RNs routinely visiting individuals weekly for monitoring, regardless of need)

- Meaningfulness to providers and other stakeholders. Often case-mix systems are criticized for not including measures that are "known" to be related to cost. But characteristics that indicate acuity are often associated with one another, so that some characteristics may "stand in" for other characteristics, or even for multiple characteristics. Some grouping systems, therefore, may be determined by fewer items than one would expect. In the aging arena, a good example is age. We know that aging is associated with increased resource use – that is, older people use more services than younger people. However, we have found that functionality (e.g., activities of daily living) explains resources better, and the effect of age on resource use is best explained by the relationship of age on functionality. So, activities of daily living may be a component of the grouping system, while age would be excluded. Including both components is unnecessary, since ADLs more strongly predict (explain) resource use. Nevertheless, our experience has been frequently that what is "known" is not, in fact, borne out in research. Thus, care needs to be taken about the role of "expert opinion" in this arena. Identifying such associated factors can be complicated, and is another reason for using existing, research-based groupings.

The development of any case-mix system is a blend of science and expert opinion. As described earlier, there are administrative criteria that need to be considered, for example, the choice of individual characteristics to be used. Often the best system is not discovered by statistical optimization. For example, in the RUG system, starting on the basis of clinically-derived classification of types of nursing home patients led to a system superior to a purely ADL-based system that had been automatically designed by the statistical software.

Number of categories
People like simple systems. It is easy to "simplify" a case-mix system by combining groups to

reduce their number. Following that type of logic to the extreme, we could have a system with only two groups – it would differentiate slightly, but not in a meaningful way. Another way to look at the number of groups is the reverse of the question posed: if a certain characteristic can split some subpopulation of persons into two or more groups that have substantially different cost structures, why ***wouldn't*** it be better to make such a split, especially as there is no real problem in having more groups?

On the other hand, states may find a very large number of groups administratively cumbersome. It complicates to some degree the task of tracking whether or not the correct allocation was issued and received. A very large number of groups may be harder for individuals and providers to understand. If the perceived clinical differentiation between groups is minimal, it may increase appeal rates as individuals seek to be moved to the next higher classification, or it may lead to more up-coding, as sympathetic assessors might see less harm in a small adjustment.

In the analyses used to create the original Resource Utilization Group (RUG) system for nursing homes, researchers used statistical approaches to split the population into groups, those groups into subgroups, and so forth. Groups were designated "terminal groups" when they could not be split further because sample sizes were too small, or because additional splits did not increase the variance explanation substantially. The resulting system had nine groups. Subsequent iterations of RUG were derived with larger sample sizes, allowing for additional differentiation. The current RUG system, RUG-IV, has sixty-six groups. While it is unlikely that a HCBS case-mix classification system would include that number of groups, the nursing home system reflects the extreme diversity among Medicare "patients" and long-stay "residents".

Step 4: Calculate Case-Mix Weights/CMI

The combined dataset – which, at a minimum, should include every individual's total HCBS claims amounts (expressed in either dollars or time), total days of coverage, and case-mix group – is utilized to calculate each group's Case Mix Index (CMI). The CMI represents the average amount of resources used by individuals in that group, relative to other groups.

To calculate CMIs, first determine the average resource use for each case-mix group. It is preferable to use an average per diem amount of resource usage rather than a total "episode" cost, since length-of-stay varies greatly. The claims amounts and total days of coverage are used to calculate each individual's average per diem resource use; this, in turn, is averaged across the group, to produce the group's average per diem resource use. Then, each group's average is turned into a relative "case-mix index", by dividing the group's average per diem resource use by that of either the full

sample or a populous reference group. Thus, the case-mix index for a group represents the relative cost of caring for the average person in that group, compared with the average person in the population. While it would seem that the choice of the divisor to create the population or reference group's CMI would make substantial difference, this is not the case. Regardless of the divisor, the CMI represent the relative cost of one group compared to another; as an example, a group that has 20% more cost will be indicated no matter what divisor is used. As we describe later, it is the relative relationship among the CMIs that drives the resource allocation.

Some states may wish to begin using case-mix resource allocation before having collected sufficient state-specific claims data. These states may choose to utilize existing research-based case-mix weights, assuming that they have adopted an existing classification system. For example, the RUG-III/HC has been validated in Ontario and Michigan, and the CMIs derived in those settings are available in the literature (see Appendix). This will allow a state to move to case-mix resource allocation more quickly and easily.

A word of caution: if the CMIs were derived in a setting that had a very different set of services and supports, or had divergent utilization policies, use of another state's CMIs may lead to decreased variance explanation. This could happen, for example, if a state is covering a different set of services than was used in the original derivation.

III. USING CASE MIX FOR FUNDING DECISIONS

 While case mix is scientific in construction, its use in resource allocation is often a political issue, designed around the goals and realities of providers and payers. Should a state have fixed rates for the care of individuals based upon the expected resource needs of an individual or should case mix be used to set a maximum budget for fee-for service reimbursement?   Should payments vary based on geographic location? How often should the system be adjusted? Should the state collapse funding practices across disparate programs? These important questions ultimately must be answered by policy makers within each state, based on the state's unique political environment.

Any proposed change that could affect a provider's bottom line is likely to heighten concerns. Unfamiliarity with case mix concepts and practices will further heighten worries. Providers, ad-

vocates, and clients/families need education if case mix is to be considered seriously. Educational efforts should build a strong foundational understanding of the new assessment system and classification structure, as well as the general principles of case mix. Once stakeholders understand and have accepted these basic premises, it becomes possible to move to the complex discussions surrounding allocation and/or payment.

Calculating Allocations From Case-Mix Weights

The most common approach to using case mix for resource allocation is to set individual rates for each case-mix group, an approach often called "pricing." The CMI weights are applied to the average cost and average acuity of all persons included in the sample to calculate the expected resource use per group. For example, in a hypothetical four group system, Groups 1 through 4 have CMIs of 0.7, 0.9, 1.6, and 2.5, respectively. We assess the population and find that the average population CMI is 1.1, calculated using the CMI as weights to the frequency distribution across the four groups. Also assume in this example that the average total expenditure for all services included in the case-mix system is $50 per day. We then calculate the budgeted amount for each group by multiplying the average cost by the ratio of the group's CMI to the average population CMI; as illustrated below. Note that in future years if the distribution across the 4 groups remains the same, the average daily allocation will be $50.00.

Group	CMI	Calculation	Daily Allocation
1	0.7	3.2 hrs x (0.7/1.1)	2.0 hrs
2	0.9	3.2 hrs x (0.9/1.1)	2.6 hrs
3	1.6	3.2 hrs x (1.6/1.1)	4.7 hrs
4	2.5	3.2 hrs x (2.5/1.1)	7.3 hrs
Overall	1.1		3.2 hrs

States may express the allocation in dollar amounts or in per unit amounts, as previously discussed. In the example, if individuals received 3.2 hours per day on average, the calculation would be changed accordingly:

Group	CMI	Calculation	Daily Allocation
1	0.7	$50 x (0.7/1.1)	$31.82
2	0.9	$50 x (0.9/1.1)	$40.91
3	1.6	$50 x (1.6/1.1)	$72.73
4	2.5	$50 x (2.5/1.1)	$113.64
Overall	1.1		$50.00

Calculating allocations in terms of amount per day, rather than per week, month , or year, enables calculations for individuals who do not stay in the program for a great deal of time.

Whatever the final allocation calculations are, a state may use the result in various ways. It may consider the result as a maximum allowable per person amount calculated over a given time-frame (month, quarter, or year), or use it to guide a base level that could be further adjusted within limits (usually a percentage) by the individual care manager, as discussed below.

## Additional Adjustments to the Group Allocation Amounts

While pricing is the easiest and most understood approach to case-mix resource allocation, it may not fit well in a particular application. A state may choose to include additional adjustments to be incorporated after determination of case-mix group and associated cost to address specific stakeholder concerns that emerge during system development. Adjustments could include factors that are known or expected to require additional funds or time, and costs that are not expected to vary with participant acuity. For example, providers in rural areas may have to travel longer distances to take clients shopping; so, rural location could be used to justify an add-on for rural participants. Another example is fixed costs, i.e., costs that are not expected to change across individuals even with differing characteristics. An example is case management, if that is a constant charge for every person in the program. By paying for this cost outside of the case-mix system, potential problems are avoided, such as underpaying an agency for this service when the agency has lower than average case mix. Finally, other adjustments could be time-limited; for example, a short-term increase in hours/funding during the recovery from an illness or transition from an institution. Most of these types of adjustments could be determined at the time of care planning.

Alternatively or additionally, states may allow for some variation from the allocation amount after the initial service plan is created, since need levels may naturally fluctuate slightly over time – plus or minus 5% of the base level of hours/funding, for example. States may allow individuals to roll-over or save unused allocations for later use, or they may not opt for that flexibility. These decisions will vary from state to state, and will be dependent on both policy goals and logistical factors.

Reimbursement Approaches

Case mix-based payments can be used in either fee-for-service or managed care environments. The starting point is an individual budget amount or range. As previously outlined, an assessment measures each person's acuity; the person's case mix group is provided as part of the software reports available to the assessor or care manager. The care manager works with the person to map out a support plan. The "budget" for the plan corresponds to the amount allocated to each group (expressed as either dollars or units), subject to any state-level adjustments described above.

Reimbursement may be made on a per-unit basis or a fixed basis. Payments that are based upon billed units work similarly to traditional fee-for-service, but within a cap or range that is adjusted for acuity. Service providers are selected to render care, and then bill the state for the services provided "as usual" (on a per-unit basis). The state may pre-authorize the claims, based upon the case mix-adjusted budget, or post-authorize them, through a manual or automated review that compares claims to the authorized allocations. Alternatively, the state may reimburse as usual, and then look back at designated time points to check whether care rendered is in accordance with the expected resource allocation. Discrepancies could be allowed or reconciled.
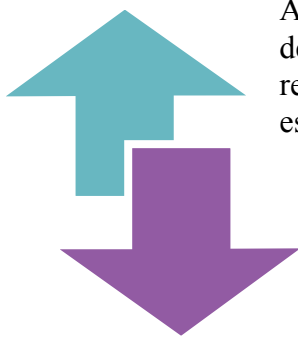
Advantages: Insures that no funds are expended for services not rendered. More closely mirrors systems in place in many states, so may not require as many changes in terms of current state and provider processes. Holds care managers responsible for their allocation decisions.

Disadvantages: Pre-authorization, post-authorization, and after-the-fact comparisons typically require new IT infrastructure, or without software, necessitate administratively cumbersome manual comparisons. May not be perceived by stakeholders as a significant policy change, which is a drawback if change is desired.

"Prospective" payments pay care coordination entities a fixed amount based upon the person's expected resource use, independent of what services are provided. Note that these payments are still made after care is rendered; however, their amounts are fixed beforehand and are not dependent upon units of care billed. In managed care arrangements, as in a 1915(b) or 1115 waiver, prospective capitated payments are the norm (e.g., "per-member-per-month" payments). States and their actuaries can use the case mix system in several ways. One option is to calculate a statewide average CMI and a statewide average payment amount for whatever services are to be included in the capitation. This method assumes that on average, all managed care entities will have a participant mix that reflects the statewide population. Alternately, the state can develop regional rates, or could pay the managed care organization a variable rate tied to the enrollee's current case mix group. Risk corridors to address possible over-or under-expenditures of capitated payments can also be developed that align with the statewide or regional CMI. We suggest that states require managed care entities to report back detailed encounter data until such time as there is widespread confidence in the payment approach and care outcomes. Even then, detailed information about the services/supports utilized by individual clients is necessary if the payment system is going to be rebased sometime in the future.
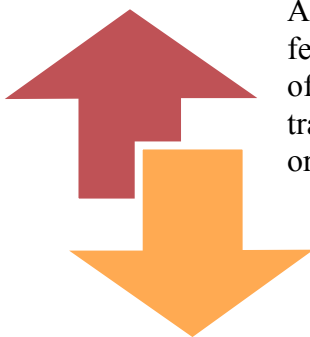
Advantages: Enables budgetary control over LTSS costs. Transfers (most) financial risk to the managed care entity. Enables use of new strategies and supports to address individual needs beyond traditional waiver program services. Supports efforts to prevent or limit use of institutional care settings.

Disadvantages: Given CMS regulations, federal approval of a prospective payment system outside of a waiver will likely be problematic. In areas of the country where managed care penetration is low, there is likely to be widespread suspicion from LTSS stakeholders. Necessitates creation of new policies and procedures at state level and state workforce retraining. May pose administrative challenges for providers

Case Mix and Self-Directed Services

Self-directed or "cash for counseling" programs may opt for either retrospective payments, normally leveraging the help of a fiscal intermediary or other coordinator, or prospective payments, such as cash-based programs which distribute payments to participants who then directly hire helpers. Checks against the case mix-adjusted budget would proceed similarly to the processes outlined above.

Case Mix and Person-Centered Planning

Case-mix systems generally set a range or ceiling amount of resources that an individual can receive. The person can choose the type of supports she prefers, as well as set a schedule for service provision. This becomes the person's plan of care. Therefore, person-centered planning is still a major component of the care planning process. A care planner and the participant can work together to develop a package of services which will meet the person's needs, within the structure set by the case-mix system.

Payments Outside of the Case-Mix System

HCBS services that have been excluded from case mix, such as unusual or episodic services, or fixed cost services not related to case mix, all previously discussed, will have to be paid for using other methodologies. Additionally, if the state develops a quality improvement program that includes monetary incentives, these payments will need to be considered outside of the base case-mix allocation. Such initiatives are discussed in Section VI.

IV. IMPLEMENTATION CHALLENGES

The implementation of a case-mix resource allocation system can be tricky. Full development of the system and supportive infrastructure may take more time and money than planned. Providers may have serious concerns about the design of the payment system or the underlying case mix classifications, although they will often confuse these two issues. Policy makers may be concerned about cost increases or insuring individual safety if services are decreased. Program participants may face changes in their allocations. While a state may not anticipate all sources of "system shock," a well thought-out "phase in" and implementation strategy can help smooth the launch. While it is beyond the scope of this document to provide a step by step implementation guide for case mix adoption, some key implementation issues that merit further consideration are discussed here.

> When Maryland planned its implementation of case mix, the state considered training and education to be part of a larger "culture change" – one in which state policy makers, case managers, providers, and participants were all active players.

Phasing in Changes

Many states encounter political opposition at multiple points in the case-mix development process. Often concerns are raised about the classification methodology, but most often it is about the final payment design, and particularly whether "my" agency will get enough funding. A planned phase-in may allow states and providers the time needed to identify and address these challenges without derailing the entire effort. For example, the state may calculate and report case-mix groupings to individuals and their providers for a time before using them to actually adjust resource allocations, or they may only begin using the system with new participants, as they enroll, "grandfathering" current participants. Alternatively, the system may be piloted fully in one region or by a few agencies before being rolled out statewide.

> Some degree of phase-in was necessary when Louisiana implemented case mix. Given care planner caseloads, it took 18 months for all existing individuals to go through the new care planning and resource allocation procedures.

Grandfathering

Complete or selective grandfathering—that is, allowing a person who would otherwise experience service reductions under the new case mix system to continue her current care plan—can prevent some headaches that would otherwise accompany implementation, as well as create new problems. Understandably, policy makers and stakeholders often worry that individuals who are used to a certain amount of assistance could be harmed by a sudden decrease. Indeed, states that have deployed case mix without a grandfathering policy have found that they face a substantial increase in complaints and appeals, requiring significant staff time to address.

> When Louisiana moved to case mix, it did not grandfather existing participants; many clients faced decreases in care time. This resulted in a large number of appeals. The only basis for appeal permitted was to assert that the assessment was incorrect, so the state also experienced a great number of reassessment requests.

If a state decides to grandfather only current clients who face service decreases, this decision will increase overall service costs until those individuals exit the program. States may wish to examine their annual turnover rate to calculate the potential budget impact of this alternative. If the state grandfathers all individuals who were previously enrolled—keeping participants at the same service level regardless of whether they would face an increase or decrease – the grandfathering would be cost neutral (assuming no change in the total number of participants). Establishing a method to enable grandfathering decisions on a case-by-case basis, outside of the formal appeals process, may be deemed more appropriate.

> As policy makers in Maryland planned the transition to case mix, they found that many existing waiver participants would face service hour decreases. The state prepared for this by developing an exceptions process to review participant requests for changes in budgets/services. The state also set aside additional funding to insure that overall costs were within the appropriated budget.

Grandfathering also has clear disadvantages. It increases the overall complexity of the system and is a source of confusion among care planners, providers, and other stakeholders already experiencing "change fatigue." Grandfathering may also necessitate two sets of processes to calculate and track service costs. Finally, creating exceptions through grandfathering runs counter to the overall purpose of case mix payment and sends a mixed message to the stakeholder community.

Algorithm Transparency

The algorithms that drive case-mix allocation determination are likely to be the subject of intense scrutiny. Should states make their algorithms available to stakeholders and the public? The primary argument for transparency is that it builds trust and shapes the perception that the system is fair and equitable. Transparency also preempts the need for Freedom of Information Act requests and the involvement of the state's legal resources. However, depending on its complexity, a published algorithm – typically written in computer code that few lay people understand – could invite additional skepticism and misinterpretation. Additionally, access to the specific algorithm logic increases the likelihood of gaming or up-coding, since unscrupulous providers or care managers will know exactly which tweaks to a person's assessment result in a higher determination. While both points of view have merit, we believe that allocation algorithms are public information and cannot be withheld from a requestor. If states publish policy that provides clear descriptions of their case mix systems, including diagrams showing how the algorithm logic is triggered, this information will be enough for most individuals; requests for the algorithms themselves can then be honored for the very small minority of individuals who demand the algorithm logic itself.

Auditing / Monitoring Case-Mix Determinations

A strong IT infrastructure will enable tracking and auditing of case-mix determinations. While auditing is essential when assessments that determine resource allocation are handled by providers, it is vital to undertake ongoing quality checks among all assessor agents, including entities providing "conflict-free" case management. Case mix "creep," in particular, can be a concern with all systems. Creep occurs when the measured acuity increases over time, independent of true change within the population. However, it can be very difficult to differentiate between creep and a true increase in acuity, which may result from providers having a reduced incentive to serve light care participants who are no longer paid at the same rate as all other participants. Assessment accuracy can also affect level of care determinations.

IT can facilitate tracking both group and CMI determinations over time, and can compare classification characteristics with other "expected" characteristics (e.g., high cognitive impairment is normally associated with IADL impairment, etc.). If CMI has increased, but the associations are not as expected, it could indicate inappropriate assessment. Auditing approaches can also focus on analysis by subgroup – for example, examining distribution patterns by assessor – and by looking at the thresholds that make a difference for funding within the system, to see if there are clusters of individuals who just make it into the next funding category. There are many external

auditing entities which offer services to states to help build effective auditing systems.

Evaluating the Impact of a Case-Mix System

States develop case mix for various reasons, and how the "effectiveness" of case mix is measured will depend on those specific reasons. Measures may include cost growth control, participant satisfaction, and number or rate of complaints and appeals. Quality metrics, which may be used in an incentive program or as overall program effectiveness indicators, are discussed in the following section.

Future Modifications and Rebasing

Most usually, the initially implemented allocation system is based upon historic payments trended forward for market-basket changes. However, over years, this calibration becomes increasingly inaccurate, and, rebasing becomes a necessity due to cost of living increases. Less frequent rebasing would constrain per person cost growth, but could lead to quality problems over time, as reimbursement may not keep sufficient pace with inflation. Over a longer period of time, there may be changes in practice patterns of how state care systems respond to need; at some point reevaluation of the CMI or even the entire case-mix measurement system will need to be considered. While such concerns may fuel a push for such reevaluation, past history – at least in nursing homes – has shown very little true change over time in practice patterns.

V. GREAT ISSUES

The Role of Informal Care (Natural Supports) and Other Funding Sources

A HCBS case-mix system is designed to predict LTSS care needs for an individual. These needs may be met solely by paid services rendered through a Medicaid HCBS program, or they may be partially met by supports outside this system, such as AOA funds, Medicare, VA services, or private insurance. The Veteran's Administration home care benefit, for example, can provide substantial funding to help an individual stay at home. Similarly, Medicare home health and rehabilitation services are available to some beneficiaries support following hospital stays. Beyond paid sources of assistance, LTSS needs are most often met by unpaid informal care, e.g., care by spouses, children, friends and neighbors.

> **Example 1:** Consider two older individuals with very similar ADL needs and other care requirements: Mr. Thomas and Mr. Ellis. Based on the case-mix system, $400 per week will be available to meet the LTSS care needs of these individuals. Mr. Thomas lives alone and does not have any informal caregivers or other outside help. Mr. Ellis lives with his son, who is home during the evenings and weekends, and provides about one hour per day of direct hands-on care. Should these two men both receive $400 a week?
>
> **Example 2:** Mr. Smith is a veteran of the Korean War and receives VA home care services, worth about $50 per week. He is seeking additional assistance from Medicaid for personal assistance. Mr. Jones, who is very similar in ADL needs and other care requirements, is receiving services only under the Medicaid system that has implemented case mix. Under the case-mix system, available funding for both individuals would be $300 per week. Should both receive $300?

Dealing with both of these "external services" issues – external formal care and informal care – in case-mix systems raises several measurement challenges. In the current fee-for-service system, there is a tangle of rules about which of the many funding sources pays first, how much each pays, and for which services. At present, states do not have the capacity to look across funding streams to identify the type or amount of external formal care. Moreover, the individual or family members may not discriminate among different funding sources or may attribute them incorrectly. Measurement of informal help in the assessment process may be spotty or missing, and informal helpers may not be available to provide such information or may have difficulty accurately recalling the amount of informal care they provide, especially support that is not directly hands-on. Monitoring and housework, for example, are services that Medicaid may otherwise pay for, but

that an informal caregiver may not be able to recall or report accurately. Informal care levels may also fluctuate as caregivers' other obligations change.

These realities raise a variety of issues, both in the design of the case-mix measurement system and in subsequent resource allocation policies and practices. First, what role should these external services (both other payers and informal care) play in the derivation of a case-mix system, including the calculation of CMIs? We are not aware of any HCBS case mix study that has examined the impact of external formal care; only in-program costs are generally available. The impact of other funding streams will be a source of reduced variance explanation for the overall system, but its influence will be difficult to tease apart from other sources of reduced variance explanation.

On the other hand, it is possible to collect estimates of the amount of informal care provided to an individual as part of the assessment process; research indicates that accuracy of estimates quickly erode as the look-back timeframe expands, thus a short look back for informal care is preferable. With that estimate, a value for informal care can be calculated and included in the overall measure of each individual's care package costs. If the system is being designed to predict units of time, the informal time can simply be added (e.g., two hours of paid care and one hour of unpaid informal care equals three total hours of care); if designing the system to predict cost, a "shadow price" for informal care can be applied to the hours to get a "shadow value" that is then added to the value of formal services. Previous research has valued informal care at 50% of the paid care cost (e.g., if one unit of paid care is worth $5, one unit of paid care and one unit of unpaid care would equal $7.50 total worth of care); the resulting case-mix system was not particularly sensitive to the choice of the shadow price. [3, 13]

Prior HCBS case mix research found that more variance in resource use was explained when both formal and informal care were considered during system development.[3, 13] However, more recent research has suggested that the impact of informal care may be more nuanced. In the recent University of Michigan HCBS case mix study of four state systems, it was found that for three states, a slight to moderately higher variance explanation was achieved when both formal and informal care were taken into account. However, in a fourth state, the variance explanation was moderately better for formal care alone.[10]

If it is better with informal care, then including informal care measures in the case-mix system will more closely mirror established care planning practices in the state; that is, this finding would suggest that assessors are already factoring in the availability of informal supports when considering the overall care plan.

Regardless of whether informal care is included in the case-mix measurement system or if individuals get external formal care, these sources of assistance clearly need to be considered at the care planner level in the allocation of resources.

- Assuming that external services are not considered in the development of CMIs, the allocation process outlined in Section III would determine the expected amount of paid care that an individual will use, assuming average external care. Therefore, individuals with more than average external care might be expected to use less paid care, while individuals with less than average external care might be expected to use more paid care. That is, if Group A on average uses 70 hours of care per month, this takes into account an average level of external care. Individuals who have less external care may, on average, use more than 70 hours of care per month, while individuals with more outside care may use less.

- The situation for informal care services is similar. The case-mix system (and CMI) estimates an average group allocation that assumes average informal care. The average informal care for each group can be estimated based on assessment data, and allocations can be increased for those with little to no informal care and decreased for those receiving substantial informal care.

Quality Incentive Programs

As has been said earlier, we strongly advise states that adopt case mix programs to initiate quality measurement efforts at the same time, to counter-balance any advantage otherwise gained by gaming or up-coding. While general principles of quality indicator development have been covered in depth elsewhere,[17] there are a number of efforts underway to define and measure quality within HCBS and encourage adoption of quality improvement initiatives. CMS regulations have always required that states develop and monitor quality assurance plans for waiver programs using state-selected quality indicators. More recently, there has been renewed interest nationally in developing standardized HCBS quality measurement. The Agency for Health Care Research and Quality's compendium of quality measures, the recently piloted National Core Indicators for Aging and Disabilities (NCI-AD), the interRAI Home Care-Quality Indicators (HC-QIs), and the recently formed National Quality Forum's HCBS committee are all major efforts that have sought to define and quantify HCBS quality.

A major issue in quality measurement is the ability to address and account for differences among the HCBS population that affect the outcome measurement. For instance, a measure of negative

functionality change (for instance, decline in independent locomotion) that does not include risk adjustment for individuals who already have become totally dependent, and thus cannot decline any farther, will make an agency that cares for a large number of these very dependent individuals who cannot decline further look "better" than an agency that serves a less functionally dependent populations who can decline. States that adopt case mix systems have at hand a valuable mechanism for risk adjustment of their quality measures, as well-constructed case mix groupings can be employed as risk adjustors for many quality measures.[22]

Another aspect of quality that has recently captured attention in HCBS circles is the use of so-called quality "incentives." Incentives may be monetary or non-monetary. Monetary incentives include pay-for-performance (P4P) programs, which either pay completely based upon outcomes or give a bonus based on them, and risk-sharing programs, which may reduce payments to providers who do not meet cost or quality goals. Non-monetary incentives generally focus on comparative public reporting. Though results of existing programs have been mixed, both types of incentives can have major effects on behavior. While there are no outstanding models of HCBS P4P programs, there is rich information about the use of P4P in other settings, particularly for Medicare providers and in the United Kingdom's National Health Service. Appendix I includes a list of resources about quality incentive programs.

ACKNOWLEDGEMENTS

APPENDIX: RESOURCES

Case Mix Design and Development

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