

Arrears Stratification in Washington State Developing Operational Protocols in a Data Mining Environment

May 2010

Funded by a Section 1115 Grant from the U.S. Department of Health and Human Services, Office of Child Support Enforcement

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Acknowledgements

This project was funded by a grant from the federal Office of Child Support Enforcement (OCSE). We gratefully acknowledge their support to make this report possible.

A number of individuals, groups and organizations were indispensable to the successful operation and completion of this project. We want to thank David Stillman, the Director of the Washington State Division of Child Support (DCS), and his leadership team. Without their support and continuing interest in our research, this report would not have been completed. We would also like to thank Brice Montgomery from DCS who provided policy advice for the report.

We highly appreciate Dr. Michael Horn, Chief of the Economic Service Administration's Management Accountability & Performance Statistics (E-MAPS), and Dr. Andrew Dyke from ECONorthwest, for their thorough reviews and valuable feedback on the report.

Our thanks go to Sarah Kollin from E-MAPS as well. She monitored the project progress and coordinated the work among researchers, the outside evaluator, DCS, and the OCSE to make sure the project went successfully. Other employees from DCS and E-MAPS who were particularly helpful to us were: Charles Donnelly, Bryan Enlow, Ken Forgy, Janet Hazelton, and Jialing Huang.

Finally, our special thanks would go to Dr. Carol Welch, the former chief of E-MAPS, who greatly encouraged us to apply for the grant and was heavily involved in the successful application process.

The Authors

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Executive Summary

ES.1 Introduction

Arrears, or child support debt, is a large and growing problem in Washington State and across the nation. By the end of Federal Fiscal Year 2009 (FFY2009), the total amount of child support arrears in Washington State had reached nearly \$1.8 billion. Studying debt and payment patterns across different types of child support cases can help to identify the underlying causes of arrears growth at the case level. This knowledge can, in turn, support development of evidence-based methods for managing child support debt in the field. Washington's Arrears Stratification project, funded by the Office of Child Support Enforcement (OCSE) 1115 Grant, sought to build the evidence base necessary to develop such practical debt management tools for caseworkers. This 18-month grant responded to OCSE's 2008 Priority Area Two: Using Business Intelligence/Data Analysis to Improve Performance.

This project builds on earlier work by Washington State's Division of Child Support (DCS) that focused on classifying child support cases according to the presumed collectability of arrears and the likelihood that a non-custodial parent (NCP) will accumulate additional arrears. This study extends Washington's earlier analysis and describes a case classification system that consists of two components: (1) a "stratification flow" that assigns cases to one of four distinct groups based on existence of an order for current support and an NCP's use of other Department of Social and Health Services (DSHS) services; and (2) a risk score that serves as an indicator of an NCP's likelihood of arrears accumulation.

The research relies on four main data sources: (1) child support data from the DCS Support Enforcement Management System (SEMS), (2) wage data from the Employment Security Department (ESD), (3) records of public service use from the Client Services Database (CSDB), and (4) incarceration data from the Department of Corrections (DOC).

Stratification

This study first develops a stratification flow based mainly on NCPs' payment obligations and use of other state services (Figure ES.1). The stratification flow classifies noncustodial parents into four strata: (1) NCPs with current support due and with other DSHS service usage; (2) NCPs with current support due and with no other DSHS service usage; (3) NCPs with no current support due and with other DSHS service usage; and (4) NCPs with no current support due and with no other DSHS service usage.

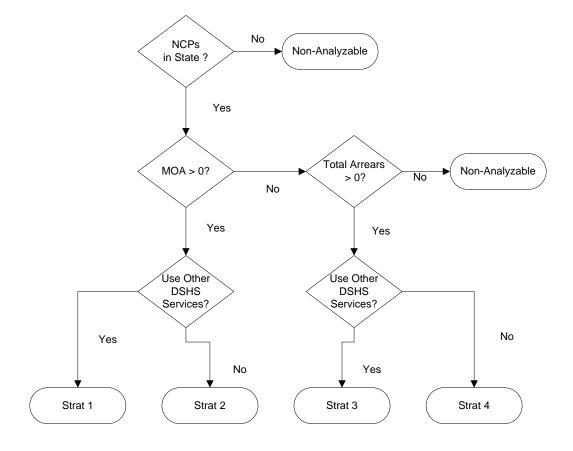


Figure ES.1 NCPs Stratification Flow¹

Risk Score

Washington's earlier work identified a number of case-level factors that strongly correlate with the creation and growth of child support debt. In this study, we develop a numeric "risk score" that summarizes the extent to which an NCP exhibits the identified risk factors. We demonstrate the relationship between the risk score, on the one hand, and debt growth and poor NCP payment patterns on the other for each strata.

The risk score includes six factors derived from data about an NCP: (1) the number of active cases; (2) the extent of use of other DSHS services; (3) the size of the NCP's current support relative to earnings; (4) whether earnings are below a critical threshold; (5) whether the NCP's child support debt is above a threshold; and (6) incarceration history. The risk score identifies low-risk noncustodial parents who are not meeting their child support obligations, but for whom targeted intervention might improvements collections. The risk score also identifies high-risk noncustodial parents where debt growth is essentially unpreventable under existing

¹ MOA refers to monthly order amount.

circumstances. For this high-risk group of NCPs, order modifications may be appropriate to prevent accumulation of uncollectible arrears.

ES.2 Major Findings

We summarize the major findings from our research, below:

- 1. Consistent with earlier work, we find that current support larger than 20% of an NCP's gross monthly earnings, or gross monthly earnings below \$1,400, corresponds to arrearage growth.
- 2. At equivalent levels of earnings and current support due, arrearage growth is generally larger for NCPs who have used other DSHS services. Below about \$3,000 gross monthly earnings, NCPs who have used other DSHS services have lower current support due than NCPs with similar incomes who have not used other DSHS services. But the service users also pay a smaller fraction of support due.
- 3. The vast majority of NCPs (over 80%) with arrearage debt who do not owe current support have gross monthly earnings below \$1,400, and their payments are typically very low. Earnings for these NCPs were likely also low when they had current support due, which would lead to the accrual of debt.
- 4. For Dec03 NCPs who only owe arrears, average monthly payments are less than one percent of average debt, suggesting that it would take about 100 months to pay off the debt on average. But there are 7,031, 30% of Dec03 arrears only NCPs, who only averaged paying \$2.16 monthly. The monthly payment of this group of NCPs was only about 0.03% of their debt and their final debt at the end of the 48 month period was \$44.4 million. We might expect this group to take about 300 months to pay off debt.
- 5. Combined with payment information, classifications of NCPs by stratum and risk score demonstrate a clear link to payment behavior. Evaluation of specific risk factors and the stratum of the noncustodial parent can lead to targeted strategies for improvements.
- 6. As risk score increases, earnings levels drop rapidly for both DSHS service users and non-service users. For a given risk score, NCPs who have not used other DSHS services tend to have lower earnings than those who have used other services. On the other hand, current support decreases with risk for NCPs who were service users and increases for those who were not. The threshold risk score above which average current support exceeds 100% of average earnings is much higher for service users than for non-users.
- 7. For service users, higher risk scores typically correspond to use of many services, suggesting a greater variety of barriers to payment. For non-service users, the number of open cases is the key factor increasing risk because more cases typically correspond to greater current support due. These conclusions support our stratification based on service use.

8. The achievement of this study is that the stratification and risk score methodology allows the identification of high risk and low risk NCPs as well as collectible and uncollectible debts. Table ES.1 shows an example of identification results by using risk score system developed in the study. Among the NCPs with current support due and debt growth over \$5,000 within 48 months, we identified a total of 2,241 low risk NCPs whose debt growth reached \$22.3 million over the 48 months. This debt growth is very likely avoidable and collectible. From the same group of NCPs, we also identified a total of 33,596 high risk NCPs whose debt growth was \$493.5 million over the 48 months. As a group, their current support obligation exceeded their income – a situation not likely to bring in full current support payment–making the accrual of debt unavoidable and the resulting debt essentially uncollectible.

	Low Risk	High Risk
Total number of NCPs	2,241	33,596
# of NCPs using other DSHS services	548	19,279
# of NCPs not using other DSHS services	1,693	14,317
Total number of custodial families involved	2,430	54,116
Total number of children involved	3,685	71,192
Total debt growth	\$22.3 Million	\$493.5 Million
Collectibility of debts	Avoidable, Collectible	Unavoidable, Uncollectible

Table ES.1 Identification of Low Risk and High Risk NCPs*

* Refers to Dec03 NCPs with current support due and debt growth over \$5,000 within 48 months.

While significantly reducing the large existing debt load will not be easy, the findings and protocols developed in this study suggest a path to such reductions and to prevention of similar debt growth in the future.

ES.3 Policy Implications

Common sense suggests that preventing debt accumulation is preferred to managing debt after it has been accrued. A 2004 report from the Office of Child Support Enforcement (OCSE) echoes this sentiment in practical terms, concluding that "the best ways to avoid the accumulation of arrears are to set appropriate orders initially, modify orders via simple procedures promptly when family circumstance change, and immediately intervene when current support is not paid." These steps seek to prevent debt accumulation that can quickly become unmanageable for the NCP. We recommend using our research to develop tools that support child support staff as they seek to achieve the following goals:

1. Develop case management strategies tailored to NCP characteristics.

Our study demonstrates the strong relationship between NCP characteristics and payment patterns. The risk score and associated data can provide caseworkers with a standardized method of identifying high- and low-risk NCPs, and of selecting the most appropriate

debt management strategies for a given case. NCPs with poor payment histories but who are at low risk of accumulating arrears are the most promising targets for more aggressive collection efforts. NCPs with poor payment histories but who are at high risk of accumulating arrears are much less likely to be capable of meeting their current support obligations, let alone reducing their accumulated debt. The most appropriate debt management strategies for this group include order modification and writing off debt that is most likely uncollectible.

2. Set appropriate orders to prevent debt growth.

Arrearage growth typically occurs when current support due is more than 20% of NCPs' gross monthly earnings and when gross monthly earnings are below \$1,400. While these thresholds are approximate, they provide a useful baseline for setting more appropriate current support obligations. Specifically, we recommend exploring: (1) Updating the Washington State Child Support Schedule; (2) Reducing default orders; and (3) Incorporating more income information, such as unemployment compensation, Social Security benefits, and labor and industry compensation into the order setting process.

3. Modify orders promptly based on changes of family circumstance.

Changes in family circumstances, such as loss of employment, an increase in family size, NCPs being on public assistance or being incarcerated, are associated with arrearage growth. DCS should change the modification review criteria to encourage more timely order modification to control the accumulation of arrearage. Specifically, we suggest: (1) Programming the Support Enforcement Management System (SEMS) to automatically conduct "3-Year Cycle"² modification reviews; (2) Adopting the following screening criteria to determine/define "substantial change in circumstances" which must be demonstrated for modification outside of the "3-Year Cycle": (a) Incarceration or release; (b) Documented disability of obligor lasting more than a year, or termination of disability; (c) Death of child in a case with multiple children; (d) Disability of a child; (e) Reasonable probability that adjustment of order will remove oblige from TANF; (f) Obligor arrears of \$3,000 or more.

4. Cooperate with other partners to help NCPs overcome their barriers.

Greater cooperation with DCS's partners, such as prosecutors, other DSHS administrations, and non-governmental partners may help DCS pursue the goals above. For example, at the time of the first paternity order, DCS should work with related

² DCS is required to do a modification review every 3 years for the cases currently on public assistance. This is called "3-Year Cycle".

partners to reach young, low-income men before they acquire multiple cases and multiple orders that they cannot pay.

While seeking ways to better manage debt, the emphasis must remain on prevention. Setting and maintaining accurate orders – orders based on actual income, taking into account significant barriers to collection within the case load – must be the highest priority.

Much of information used in this study is not easily accessible to case workers. But centralized data processing using existing databases and data warehouses could be used to transmit key data points to staff in the field through a web-based application. These would include details about each NCP's risk score and flagging of existing or potential problems.

The problems and trends identified in this report are not unique to Washington State. Consistent with the goals of OCSE's 1115 grant program, we believe our reported findings to be of value to other states with the technical infrastructure to develop approaches to NCP stratification and debt management strategies similar to those outlined in this report.

1 Introduction

Arrears, or child support debt, is a large and growing problem in Washington State and across the nation. By the end of Federal Fiscal Year 2009 (FFY2009), the total amount of child support arrears in Washington State had reached nearly \$1.8 billion. Studying debt and payment patterns across different types of child support cases can help to identify the underlying causes of arrears growth. Washington's Arrears Stratification project, funded by the Office of Child Support Enforcement (OCSE) 1115 Grant, sought to build the evidence base necessary to develop such practical debt management tools for caseworkers.

1.1 Background

The work reported here updates and extends previous work done under OCSE Grant #90-FD-0027. We will briefly introduce our previous work on arrears in this section. The original work was reported in 2003 as "Determining the Composition and Collectability of Child Support Arrearages - Volume1: The Longitudinal Analysis (Formoso, 2003), and Volume 2: The Case Assessment (Peters, 2003)." The longitudinal analysis (V1) was based on individuals, using a cohort of 241,731 noncustodial parents (NCPs) selected as all active NCPs in the third calendar quarter of 1995 (95Q3). Division of Child Support (DCS) records from 93Q4 to 97Q2 were used to look at debt behavior of the cohort in the study. Four common payment patterns were identified for the sampling required for the case assessment study (V2): steadily increasing debt, steadily decreasing debt, unchanging debt, and intermittent with both increasing and decreasing debt and at least four separate spells of debt behavior. Part of the work reported in V1 involved development of neural network and decision tree models to predict debt growth outcomes and collectability. Using these models we were able to predict with good accuracy whether debt would increase, decrease, or remain unchanged.

Figure 1.1 illustrates the debt classification scheme in the V1 study. Out-of-State NCPs are not considered because we do not have data on their earnings or possible barriers to payment. The study found that below about \$1,400 monthly wage, support obligations of NCPs have on average been set far above the level that would prevent arrearage growth. The study also found that arrearage tended to grow when monthly order amounts were set above about 20% of gross monthly earnings. On the contrary, above \$1,400 monthly wages, support obligations have on average been set far below the level where arrearage would grow. The debt increase for this group of NCPs was avoidable and collectible. Barriers to payment were used to classify total debts as collectible or uncollectible for NCPs with monthly wage under \$1,400. Documented barriers include NCPs with history of grants/public assistance usage; NCPs with multiple IVD cases as NCP; NCPs who also had at least one IVD case on which they were the CPs; NCPs with drugs/alcohol problems; NCPs with disability; NCPs with limited English proficiency. Low

earning NCPs without barriers may have debt that is at least partially collectible. However, low earning NCPs with barriers will more likely have uncollectible debts.

Figure 1.2 classifies changes in arrears debt observed in the 2003 study as mostly collectible or as uncollectible, based on classification scheme shown in Figure 1.1. The V1 report suggested different strategies to deal with debt in each of the three circled categories.

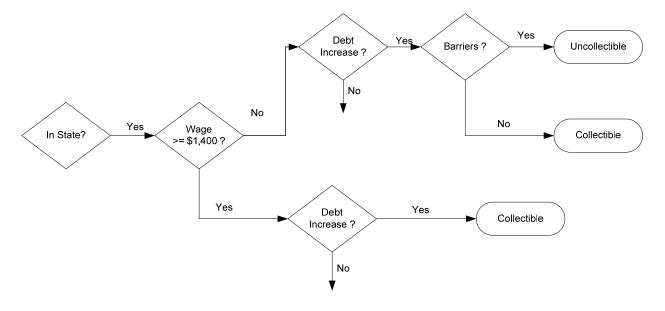
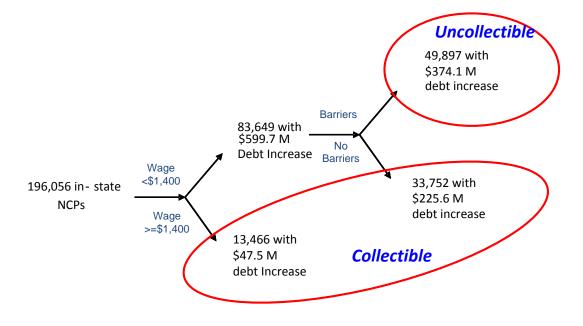


Figure 1.1 Debt Classification Scheme (2003 V1 Study)

Figure 1.2 Collectible and Uncollectible Debts (2003 V1 Study)



The V2 study randomly selected 200 individuals from each payment pattern (increasing debt, decreasing debt, no change, and intermittent change) and examined all cases linked to those individuals. It found that, of the four samples, NCPs in the steadily increasing debt sample had the highest order amounts but the lowest wages. They were expected to pay an average of 1.77 times their gross earnings, compared to a range of 0.04 to 0.20 in the other three samples. As in the V1 study, the V2 study also found that arrearage tended to grow when monthly order amounts were set above about 20% of gross monthly earnings. The V1 study showed that barriers to payment will lead to the accumulation of arrears which will become mostly uncollectible debts. By checking the different barriers³ NCP may face, the V2 study found that only 20.6% of NCPs in the steadily increasing debt sample showed no payment barriers, compared to a range of 47.7% to 61.4% with no barriers in the other three samples.

The state of Virginia (2007) followed up on our predictive modeling work and developed a predictive model based on three levels of risk – high, medium, and low risk. Virginia was also able to do a trial implementation of their model. Sorensen et al (2003) used a simple simulation method to measure the collectability of California's child support arrears and they estimated that a maximum of 25 percent of arrears were likely to be collected in 10 years. While predictive models can definitely be useful, they offer no strategies for improving outcomes. The new work reported here is aimed at developing possible strategies for improving outcomes and the lives of custodial families. In addition, building separate predictive models on each of the strata identified in the present work can possibly lead to improved prediction in future studies.

There have been many changes in data collection and availability after the V1 and V2 studies. Only quarterly database records from the DCS were available for the V1 study, but we now have monthly DCS history back to January 1999 in a data warehouse developed in part under OCSE Grant #90-FD-0058/05. The data warehouse also provides access to data elements which were only available in case records for the V1 and V2 studies. For the V1 study we had access to only limited data on cross-program use by NCPs, but we now have a routine database feed of crossprogram use for all DCS clients which includes all services used by month within nine operational agencies under the Department of Social and Health Services (DSHS). In addition, we now have access to database records for incarceration and arrest for DCS clients. All these changes lead us to update and extend the previous report so that we will have a better understanding of arrearage to develop arrearage management strategies.

1.2 Project Goals

The project goals are:

³ Documented barriers in the V2 study include NCPs with corrections record/arrests; NCPs with history of grants/public assistance usage; NCPs with multiple IVD cases as NCP; NCPs who also had at least one IVD case on which they were the CPs; NCPs with drugs/alcohol problems.

- (1) Develop both a basic stratification flow and a ranking system for risk of poor payment outcomes;
- (2) Identify noncustodial parents with low- or high-risk of arrear accumulation which allows the development of targeted strategies for managing noncustodial parent poor payment behavior;
- (3) Develop policy implications for DCS on how to prevent future arrearage accumulation and manage the existing debts efficiently.

The remainder of this report is organized as follows. Section 2 lays out the data and methods as well as stratification flow and NCP characteristics by strata of three cohorts; section 3 investigates the relationship between arrearage growth, earnings, and child support monthly order amount to identify reasonable factors for developing risk score; section 4 illustrates how NCP's earnings, monthly order amount, payment, and debt growth change with risk score by strata; Section 5 examines spells of arrear change by risk score in order to show the importance of payment regularity in addition to payment amount; section 6 tests the developed stratification and risk score system by the cohort of Dec07 NCPs; section 7 demonstrates how to convert the study to operational tool to identify low risk and high risk NCPs; Conclusions and policy implications are summarized in section 8.

2 Data and Methods

This section lays out the data and methods as well as stratification flow and NCP characteristics by strata of three cohorts. A stratification approach was used to classify NCPs according to their residency, current support status, and use of other DSHS services. We began our stratification work by posing four questions:

(1) Can we acquire enough information on the NCP? This leads to our first level of stratification by setting aside NCPs who do not reside in Washington.

(2) **Does the NCP owe current support?** This leads to our second level of stratification by separating NCPs who owe current support from those who do not.

(3) What are the NCP payment obligations when no current support is due? This leads to our third level of stratification by setting aside NCPs who have no payment obligation.

(4) Does the NCP have a history of payment barriers, indicated by use of other state services? This leads to our fourth level of stratification by separating NCPs who have used public services from those who have not.

This forms a decision tree and the answers to these questions establish a basic stratification flow (Figure 2.1), giving us four working strata, and two strata which were not analyzable (see Appendix I-1 and Appendix I-2).

One important difference between the strata is that strat 1 and strat 3 are unlikely to have hidden income since many of the state services used by these NCPs are means tested. If there is hidden income it will more likely be found in strat 2 and strat 4 where there is no history of use of other state services.

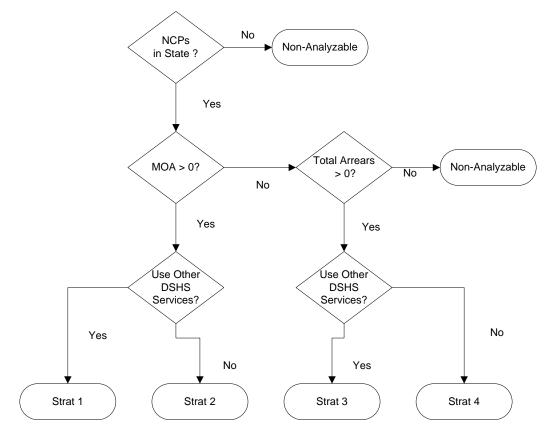


Figure 2.1 NCPs Stratification Flow

A ranking system was also developed to overlay the stratification flow displayed in Figure 1.1. By defining a risk score based on factors linked to poor payment outcomes, we identify NCPs most likely to develop additional arrears and least likely to pay down existing debt.

The risk score incorporates six data factors about an NCP:

(1) The extent of use of DCS services. This is measured by the number of active cases. Payment outcomes deteriorate as the number of cases for the NCP increases.

(2) The extent of use of other state public services. This is measured by the number of DSHS service report groups. The more report groups, the more services used which means the more barriers an NCP faced to pay the child support.

(3) **Incarceration history.** NCPs being incarcerated or with incarceration history will greatly impact their ability to pay the child support which will result in debt growth.

(4) The size of the NCP's current support relative to earnings. Our previous study has shown that child support debts tend to grow when the total current support exceeds 20% of NCP's income.

(5) Whether earnings are below a critical threshold. From the V1 study, below a threshold of about \$1,400 per month gross earnings, monthly order amounts were set too high, on average, to prevent arrearage growth. Above \$1,400 per month earnings, monthly order amounts were, on average, set below the level that would cause arrearage growth.

(6) Whether the NCP's child support debt is above a threshold. High initial debts indicate poor payment behavior in the past which is also likely to continue.

Through developing the stratification flow and risk score system, the research will further study the linkage of NCPs' payment behavior to their stratum and associated risk factors. Evaluation of specific risk factors and the stratum of the noncustodial parent can lead to targeted strategies for improvements.

2.1 Data sources

The study relies on four main data sources: (1) child support data from the DCS Support Enforcement Management System (SEMS), (2) wage data⁴ from the Employment Security Department (ESD), (3) records of public service use from the Client Services Database (CSDB), and (4) incarceration data from the Department of Corrections (DOC).

The study uses three cohorts of NCPs: those with active cases in December 2003 (Dec03), those with active cases in December 2005 (Dec05), and those with active cases in December 2007 (Dec07). We used the NCP group from 2003 to develop the stratification methods, the 2005 group was used to verify the methods, and the group from 2007 was used to evaluate the methods as they might be used in a practical application. Table 2.1 provides detail about the data used for the analysis of each cohort.

⁴ ESD data does not provide a complete earnings record since only earnings covered by unemployment insurance are reported.

Cohorts	DCS Data	ESD Data ¹	CSDB Data ²	DOC Data ³	Puporses of Cohorts
Dec03 NCPs	Jan 2002 - Dec 2005	Jan 2002 - Dec 2005	Jul 2000 - Jun 2004	Mar 2002 - Jun 2004	Develop method
Dec05 NCPs	Jan 2004 - Dec 2007	Jan 2004 - Dec 2007	Jul 2002 - Jun 2006	Mar 2002 - Dec 2005	Verifymethod
Dec07 NCPs	Jan 2006 - Dec 2007	Jul 2005 - Jun 2007	Jul 2002 - Jun 2006	Mar 2002 - Dec 2007	Pratical application

Table 2.1	Data Info	ormation	for Three	Cohorts	of NCPs
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Note:

1. ESD wage data always have six month lag, so we incorporate six month lag for Dec07 cohort.

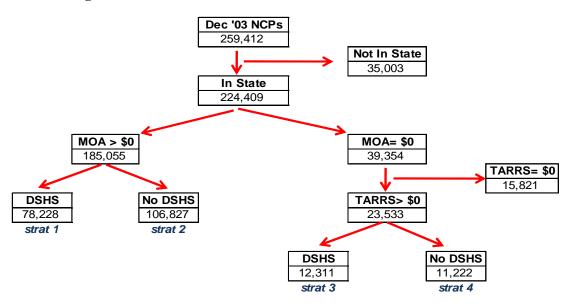
2. CSDB data is reported by State Fiscal Year (SFY, July to June). It may have more than 1 year lag.

3. Historical DOC data was not systematically maintained until July 2006, so incaraceration data for some months were missed before July 2006.

2.2 The Stratification Flow by Cohort

Figures 2.2 - 2.4 show the basic stratification flows (i.e., the number of NCPs in each identified classification) for each of the three NCP cohorts.

Figure 2.2: Basic Stratification Flow for December 2003 NCPs⁵



⁵ TARRS: Total Arrear Amount.

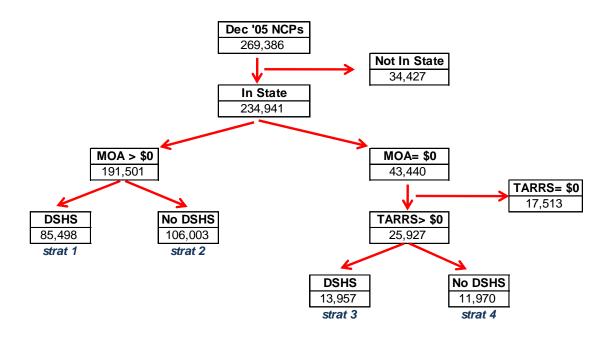
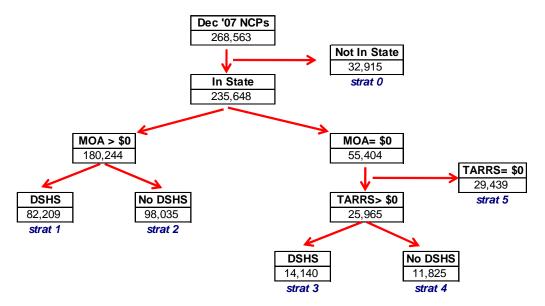


Figure 2.3: Basic Stratification Flow for December 2005 NCPs

Figure 2.4: Basic Stratification Flow for December 2007 NCPs



Tables 2.2 - 2.4 provide summary statistics about the four analysis strata (strat 1 – strat 4 in the figures) for each of the three cohorts.

Dec03	strat 1	strat 2	strat 3	strat 4
Number of NCPs	78,288	106,827	12,311	11,222
Monthly Order Amount (MOA)	\$222	\$363	\$0	\$0
Payment	\$135	\$325	\$46	\$98
Wages	\$677	\$1,536	\$429	\$622
Total Arrear Amount (TARRS)	\$9,293	\$6,131	\$8,167	\$9,861
Debt Growth	\$2,821	\$1,232	-\$2,442	-\$4,574
Share of NCPs with MOA>20% of wages	70.7%	61.6%	0.0%	0.0%
Share of NCPs with wages<\$1,400	83.4%	59.2%	90.6%	81.6%
Payment/MOA	60.7%	89.3%		
Payment/TARRS			0.6%	1.0%
Risk Score	10.8	3.7	10.2	3.2

Table 2.2: Characteristics of December 2003 NCPs, by strata⁶

Table 2.3: Characteristics of December 2005 NCPs, by strata⁶

Dec05	strat 1	strat 2	strat 3	strat 4
Number of NCPs	85,498	106,003	13,957	11,970
Monthly Order Amount (MOA)	\$216	\$374	\$0	\$0
Payment	\$150	\$357	\$57	\$117
Wages	\$775	\$1,726	\$478	\$680
Total Arrear Amount (TARRS)	\$9,481	\$6,120	\$8,911	\$10,799
Debt Growth	\$2,543	\$938	-\$2,589	-\$4,566
Share of NCPs with MOA>20% of wages	66.5%	58.8%	0.0%	0.0%
Share of NCPs with wages<\$1,400	79.9%	56.6%	88.3%	80.3%
Payment/MOA	69.5%	95.5%		
Payment/TARRS			0.6%	1.1%
Risk Score	10.6	3.6	10.0	3.3

⁶ To calculate the values in the tables, averages over 48 months are determined for each NCP and then values are averaged or calculated within strata. Ratios in the tables are calculated from average strata values. For each NCP averages for MOA and TARRS included only months where there was an open case (sum of values in open months divided by number of open months), but averages for payments and wages included all 48 months. Debt growth is debt in the last month with an open case minus debt in the first month with an open case.

Dec07	strat 1	strat 2	strat 3	strat 4
Number of NCPs	82,209	98,035	14,140	11,825
Monthly Order Amount (MOA)	\$236	\$408	\$0	\$0
Payment	\$141	\$333	\$50	\$102
Wages	\$792	\$1,756	\$439	\$625
Total Arrear Amount (TARRS)	\$9,345	\$6,047	\$11,491	\$13,844
Debt Growth	\$1,703	\$809	-\$1,367	-\$2,348
Share of NCPs with MOA>20% of wages	69.6%	61.0%	0.0%	0.0%
Share of NCPs with wages<\$1,400	79.0%	57.5%	88.7%	82.1%
Payment/MOA	59.8%	81.5%		
Payment/TARRS			0.4%	0.7%
Risk Score	10.6	3.7	10.1	3.5

Table 2.4 Characteristics of December 2007 NCPs, by strata ⁶	Table 2.4	Characteristics	of December	: 2007 NCPs.	bv strata ⁶
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The values given in Tables 2.2 through 2.4 are averages for each group. Section 4 describes the large variation within strata by illustrating how each variable changes with risk score. As illustrated in these tables, case characteristics vary consistently and predictably across strata. For example, average monthly order amounts (MOA) are much lower for strat 1 NCPs (with DSHS use) than for strat 2 NCPs (no DSHS use). However, since strat 1 NCPs pay a smaller percentage of their monthly order amount, they have larger average total arrear amount and greater debt growth.

Average monthly wages for strat 1 NCPs are less than half of wages for strat 2 NCPs. This leads to MOAs that represent a higher proportion of gross monthly earnings for strat 1 NCPs (see Figure 2.5). As a result, a higher percentage of strat 1 NCPs have MOA set above 20% of wages, and a higher percentage of strat 1 NCPs have gross monthly wages less than \$1,400.

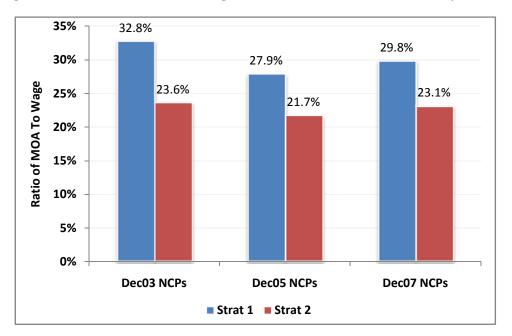


Figure 2.5 Ratio of MOA To Wage for Strat 1 and Strat 2 NCPs, by Cohort

When only arrears are due, payments by strat 3 NCPs (DSHS use) are about half of payments by strat 4 NCPs (no DSHS use) and strat 3 payments are a smaller percentage of wages and a smaller percentage of average debt. The vast majority of strat 3 and strat 4 NCPs have gross monthly wages less than \$1,400.

3 Relationship between Arrearage Growth, Earnings, and Monthly Order Amount by Stratum

In this section we focus on how arrearage growth relates to the interaction of earnings and current support in strat 1 and strat 2, where MOA > \$0. The relationships inform the risk factor selection presented in the next section. Strat 1 and strat 2 include the majority of NCPs in the study groups – 185,055 out of 208,588 for Dec03 and 191,501 out of 217,428 for Dec05. We will highlight the similarities and differences between NCPs who use other DSHS services and those who do not.

After checking the relationship of debt growth, earnings, and MOA for Dec03 and Dec05 cohorts, we found that the observed relationships are quite stable over time. Therefore, we only show the relationship for Dec05 NCPs in this section. The results of Dec03 NCPs can be found in Appendix III-1. Figure 3.1 shows contours of arrearage growth in relation to earnings and current support for strat 1 NCPs (MOA > 0 and DSHS use). The lower right section in the figure – higher earnings and lower MOA – represents decreasing debt and the upper left section – lower earnings and higher MOA – represents increasing debt, with the zero (0) contour representing the relation between earnings and MOA where arrearage does not change.

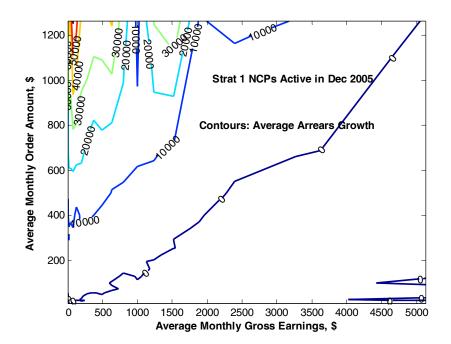


Figure 3.1: Contours of Debt Growth for Dec05 Strat 1 NCPs

The contours are estimates and cannot be considered exact, but they do provide a reasonable picture of how arrears growth changes with earnings and MOA. While the locations of arrearage growth contours have changed since the original work (Formoso, 2003) the location of the zero contour has been quite stable, with only minor differences between the original work (Formoso, 2003), the Dec03 NCPs, and the Dec05 NCPs. Detailed information about how the contour charts were created is in Appendix IV-1.

Although strat 2 NCPs have similar pattern of how arrearage growth relates to earnings and MOA with strat 1 NCPs, They show difference in debt growth distribution over earnings and MOA (see Figure 3.2). At equivalent monthly earnings, the contours of arrears growth occur at somewhat lower MOA for strat 1 NCPs (red contours). For example, the contour for strat 1 average arrears growth of \$10,000 is essentially the same as the \$5,000 growth contour for strat 2 (blue contour). While the two zero contours are nearly the same up to about \$2,500 earnings, above that the strat 2 zero contour occurs at a higher MOA relative to earnings.



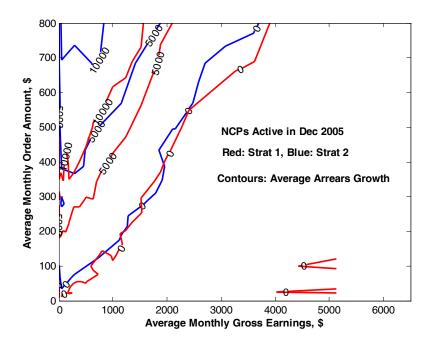


Figure 3.3 shows that strat 1 NCPs cross over into arrearage growth when MOA is 20% of earnings on average. Above about 24% MOA To Wage ratio (MTW) all data points show arrearage growth.

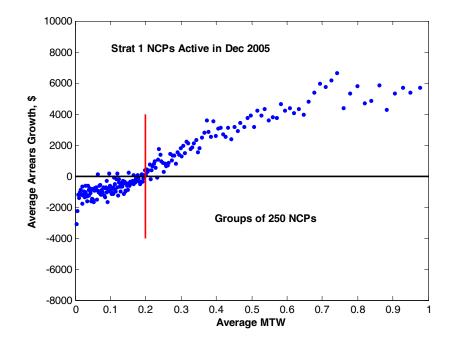


Figure 3.3: Debt Growth Relates to the MOA/Wages Ratio – Strat 1 Dec05 NCPs⁷

Strat 2 NCPs have similar pattern as strat1 NCPs except that on average conversion into arrearage growth occurs somewhat above 20% MTW. All data point above about 28% MTW show arrearage growth. This is consistent with findings in the original work (Formoso, 2003).In the Figure similar to Figures 3.3 and 3.4in the original work (Formoso, 2003) all data points above 20% MTW showed growth in arrears.

⁷ NCPs are ordered by MTW with averages taken in groups of 250 NCPs.

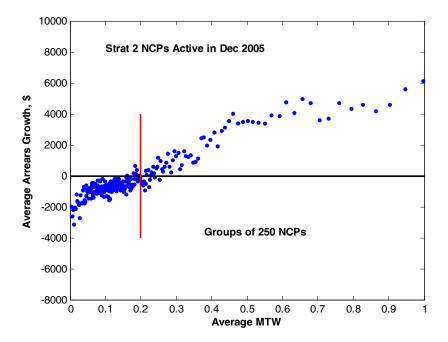


Figure 3.4: Debt Growth Relates to the MOA/Wages Ratio – Strat 2 Dec05 NCPs⁸

Figure 3.5 superimposes the actual setting of strat 1 MOA relative to earnings on the strat 1 contour diagram from Figure 3.1. The setting of MOA crosses into the region of arrearage growth at about \$1,400 gross monthly earnings. This relationship also applies to Strat 2 NCPs.

Figure 3.6 compares MOA for strat 1 and strat 2 NCPs. Up to about \$3,000 monthly earnings, MOA is set lower relative to earnings for strat 1 NCPs than that for strat 2 NCPs strat 1 average MOA is set lower than strat 2 average MOA.

⁸ NCPs are ordered by MTW with averages taken in groups of 250 NCPs.

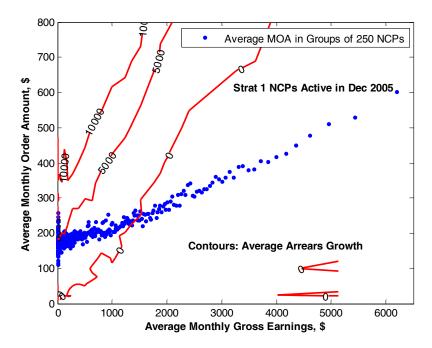
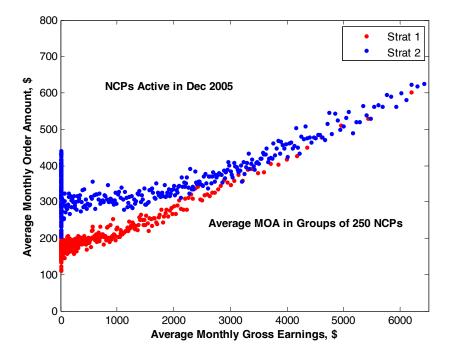


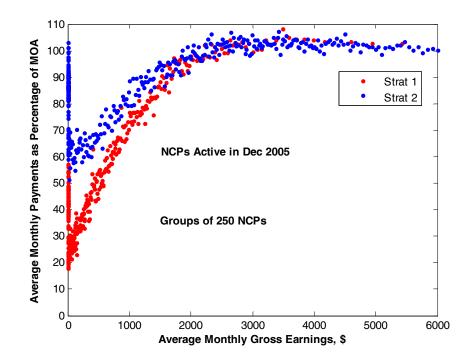
Figure 3.5: Actual MOA and Contours of Debt Growth for Dec05 Strat 1 NCPs⁹

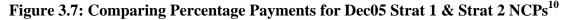
Figure 3.6: Comparing Actual MOA for Dec05 Strat 1 & Strat 2 NCPs



⁹ For actual MOA NCPs are ordered by earnings with averages taken in groups of 250 NCPs.

On average strat 1 NCPs also make lower payments relative to MOA than strat 2 NCPs (see Tables 2.2 - 2.4). Figure 3.7 shows that at low earnings strat 1 NCPs pay a lower percentage of MOA than strat 2 NCPs, even though strat 1 MOAs are lower as seen in Figure 3.6. The data points for the two strata appear to merge above \$3,000 monthly earnings. At equivalent low earnings, even though current support is lower, strat 1 NCPs are paying a smaller fraction of current support than strat 2 NCPs.

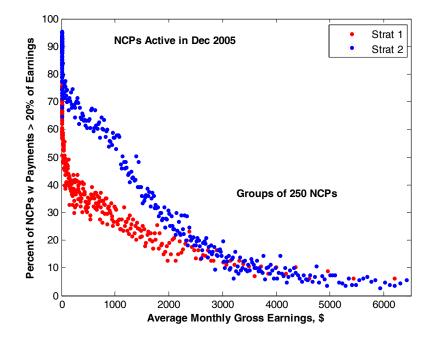




An interesting difference is seen in Figure 3.8 when we compare the percentage of NCPs paying more than 20% of earnings in strat 1 and strat 2. At very low earnings (approximately \$30 monthly), the strat 1 data crosses the 50% line while at the same earnings level about 80% of strat 2 NCPs are paying more than 20% of earnings. The strat 2 data crosses the 50% line at approximately \$1,500 monthly earnings. From very low earnings to above \$3,000 monthly earnings strat 2 NCPs are much more likely to be paying a larger portion of income towards child support than strat 1 NCPs.

¹⁰ Average Payments for each group of 250 NCPs are divided by average MOA from Figure 3.6.

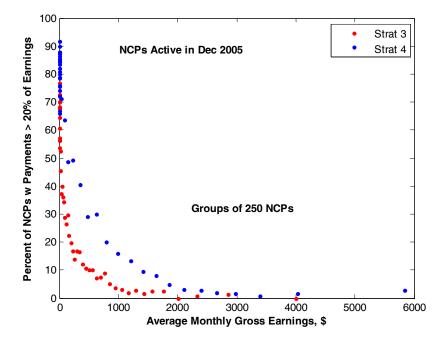
Figure 3.8: Comparing Percentage of NCPs Where Payments Exceed 20% of Wages for Dec05 Strat 1 & Strat 2 NCPs¹¹



Similar as NCPs with current support, arrear only NCPs without using other DSHS services (Strat 4) are also more likely to be paying a larger portion of income towards child support than NCPs using other DSHS services (strat 3). The data in Figure 3.9 is more sparse than the data in Figure 3.8, but the same pattern exists. The data for strat 4 NCPs consistently lie above the data for strat 3 NCPs.

¹¹ NCPs are ordered by earnings with percentages taken in groups of 250 NCPs.

Figure 3.9: Comparing Percentage of NCPs Where Payments Exceed 20% of Wages for Dec05 Strat 3 & Strat 4 NCPs¹²



This section illustrated the relationships between debt growth, earnings, and MOA, and suggests dramatic arrearage growth when MOA exceeds 20% of NCP earnings and NCP earnings below \$1,400 per month. The findings here will help to build the risk score system in the next section.

¹² NCPs are ordered by earnings with percentages taken in groups of 250 NCPs.

4 Development of Risk Score System

4.1 Risk Factors

The relationships between arrearage growth, earnings, and MOA illustrated in the last section provide support to the risk score system developed in this section. We consider six risk factors associated with NCPs: use of DCS services, use of other public services, the relation of current support to earnings, earnings below a threshold, debt above a threshold, and incarceration history. We next show how the six factors included in the calculation of risk score individually affect outcomes.

1) Use of DCS services

The extent of DCS service use is measured by the number of open cases. Payment outcomes deteriorate as the number of cases for the NCP increases. Figure 4.1 shows the rapid decline in payments as a percentage of MOA with increasing cases. NCPs with only one case pay an average of 85.2% of current support, NCPs with two cases pay an average of 72.3% of MOA, and NCPs with three cases pay an average of 59.6% of MOA. Data points become erratic at higher case numbers because these points include only small numbers of NCPs. See Appendix IV-2 for detailed information.

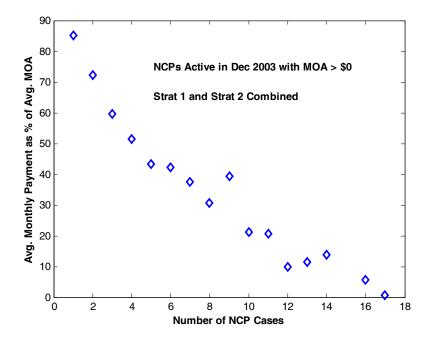


Figure 4.1: Payment Outcomes Relate to Number of NCP Cases

Figure 4.1 exposes an important pattern by suppressing variability (each data point in the chart represents a group of NCPs with a range of percentage payment), but the relationship between payment outcomes and number of cases is also statistically significant at the individual level (see Appendix IV-2).

Figure 4.2 shows that as number of cases increase, on average, MOA to wage ratio increases which leads to the increase of total arrears. We also found that NCPs with multiple cases are more likely to have incarceration history and tend to use more of the other DSHS services. Each of these factors indicates that NCPs with more cases have less ability to pay.

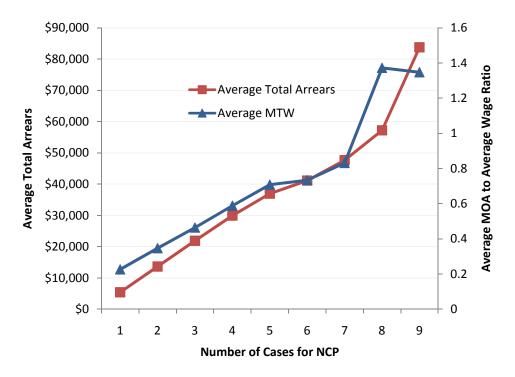




Table 4.1 compares the total arrearage for NCPs with a single case to NCPs with multiple cases. In approximate terms, 20% of NCPs have multiple cases but they carry nearly as much debt as the 80% of NCPs who have single cases.

Dec03 NCPs	Singe Case	Multiple Cases
Total number of NCPs	161,833	39,997
% of NCPs	80.2%	19.8%
Total number of custodial families involved	161,833	100,370
Total number of children involved	254,721	110,805
Total Arrearage over 48 Months	\$874 Million	\$708 Million
% of Total Arrearage	55.2%	44.8%

Table 4.1 NCPs with Single Cases vs. NCPs with Multiple Cases

2) Use of Public Services

NCP use of other public services is clearly linked to poor payment outcomes. The CSDB contains a wealth of information on public service use. We obtain this information by month rolled up at what is called the report group level. Each report group gathers together similar services within a DSHS sub-agency, with 70-80 report groups overall in DSHS. For each NCP, for each month of public service use, we obtain the report groups used, the number of service events in each report group, and the cost of services used in each report group. While CSDB production lags current time by one or two years, we have found strong correlations in service use across years, and that CSDB data as much as five years old can relate to outcomes (see Appendix II). For this reason we use four years of public service use data in stratification and risk score.

With our CSDB data we can measure extent of use by number of service months, number of service events, service costs, or number of report groups. All of these measures show the same thing – any use of services, even only one month of service, is linked to poorer payment outcomes. We have chosen to use the number of report groups, reasoning that use of a wider range of services indicates a wider range of problem issues with less likelihood of resolution. The integer nature and smaller range of the number of report groups is also analytically useful.

As an example, Figure 4.3 shows how average payments as a percentage of average monthly order amount (MOA) decrease with increasing number of report groups used. Data points above 20 report groups are erratic because these points include only small numbers of NCPs. See Appendix IV-3. When MOA is more than \$0, with no groups used (blue circle in Figure, no other DSHS services used, strat 2 NCPs) payments are 89.3% of MOA, but when just one group is used (first red star on chart, use of other DSHS services, strat 1) payments are 73.6% of MOA; this is almost a sixteen percentage point drop in payments on obligations.

Figure 4.3 exposes an important pattern by suppressing variability (each data point in the chart represents a group of NCPs with a range of percentage payment), but the relationship between payment outcomes and extent of public service use is also statistically significant at the individual level (see Appendix IV-4).

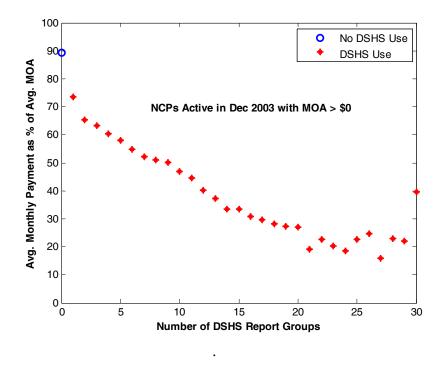


Figure 4.3: Payment Outcomes Relate to Extent of Use of Public Services

3) Relations Between MOA and Earnings

The last section demonstrated that arrearage growth generally occurs when MOA is above 20% of earnings. Therefore, MOA at 20% of earnings will be used in defining risk scores.

4) Low Wage

The last section demonstrated that arrearage growth can be expected when NCPs have average monthly gross earnings less than \$1,400. This value will be used as a threshold in defining risk scores.

5) High Debt

If the NCP has a high arrearage debt at the beginning of the observation period this most likely means that low payments relative to obligation have been made in the past. This behavior is also likely to continue. Figure 4.4 shows that higher debt at the beginning of the 48-month period relates to lower payments on MOA during the 48 month period for NCPs with current support due. Figure 4.5 shows that this is also the situation for NCPs who only owe arrears.

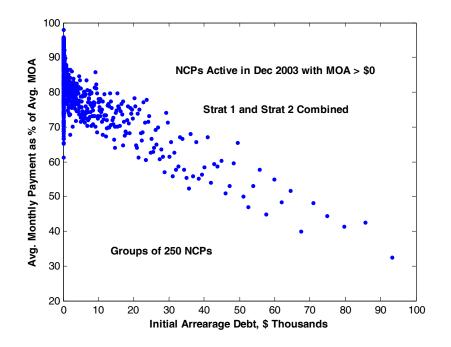
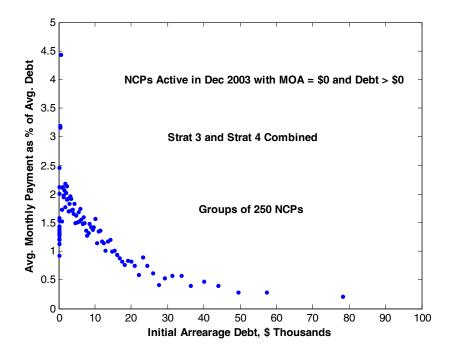


Figure 4.4: Payment on MOA Relates to Initial Debt for Dec03 Strat 1 and Strat 2 NCPs

Figure 4.5: Payment on Arrears Relates to Initial Debt for Dec03 Strat 3 and Strat 4 NCPs



Figures 4.4 and 4.5 expose important patterns by suppressing variability (each data point in the chart represents a group of NCPs with a range of percentage payment), but the relationship between payment outcomes and initial debt is also statistically significant at the individual level (see Appendix IV-4).

6) Incarceration History

For Dec03 NCPs we used incarceration records from March 2002 to June 2004. Of the 259,412 NCPs with December 2003 active cases 3,303 had incarceration records in the 28 month period. Although incarceration history is not common, payment outcomes are significantly lower with incarceration history.

NCPs with DOC records have higher debt, make more costly use of other DSHS services, have lower wages, and pay a lower fraction of MOA. Overall, NCPs with incarceration history paid 19.9% of MOA while NCPs without incarceration history paid 83.7% of MOA.

NCPs with DSHS service history are more likely to also have DOC history. The percent of NCPs with incarceration history in strat 1 (DSHS service use) is about double that in strat 2 (no DSHS service use) and the percent of NCPs with incarceration history in strat 3 (DSHS service use) is higher than in strat 4 (no DSHS service use). These differences are statistically significant with p < 0.0001.

Table 4.2 compares Dec03 NCPs with and without incarceration history in the four strata. All differences within stratum are t-test significant at the p < 0.0001 level, except for strat 4 as indicated in the table footnotes. Payment as a percent of current support due drops from 65.3% to 28.0% in strat 1 and from 91.4% to 33.9% in strat 2. Payment as a percent of average arrearage debt drops from 3.3% to 0.5% in strat 3 and from 3.5% to 0.6% in strat 4.

	stra	t 1	strat 2		strat 3		strat 4*	
	No DOC	DOC	No DOC	DOC	No DOC	DOC	No DOC	DOC
num NCPs	76,045	2,183	106,040	787	12,071	240	11,156	66
Avg. Pmt	\$137	\$34	\$327	\$45	\$46	\$20	\$99	\$30
Avg. MOA	\$223	\$192	\$365	\$202	\$0	\$0	\$0	\$0
Avg. Debt	\$9,059	\$17,467	\$6,041	\$18,166	\$8,094	\$11,842	\$9,848	\$12,168
Pct. Pmt #	65.3%	28.0%	91.4%	33.9%	3.3%	0.5%	3.5%	0.6%

Table 4.2: The Effect of Incarceration History

- percent payment calculated at the individual level as payment/MOA in strat 1 and strat 2 and as payment/debt in strat 3 and strat 4; Pct. Pmt analysis restricted to NCPs with less than 500% payment.

* - t-test significance: Avg. Pmt p=0.02, Avg. Debt not significant, Pct. Pmt p=0.03.

4.2 Risk Score

We developed the risk score based on the risk factors analyzed in section 4.1. There are correlations between the factors and this makes it difficult to determine the true magnitude of effect for each factor. We make no claim that this is the best possible ranking system. However, what we do have does show good discrimination in ranking NCPs for likelihood of poor payment outcomes. Attempts at weighting factors did not improve discrimination.

The risk score for each NCP is the sum of:

1) Number of NCP cases,

2) Number of CSDB report groups (each group counted only once)

3) High MOA – wage ratio (MTW) indicator:

a) =0 when average MOA is 20% or less of average wages

b) =1 when average MOA is more than 20% of average wages

c) =2 when average MOA is more than 40% of average wages

4) Low wages indicator:

a) =0 when average wages are \$1,400 or higher

b) =1 when average wages are less than 1,400

c) =2 when average wages are less than \$250

5) High debt indicator:

a) =0 when average TARRS is 10,000 or less¹³

b) =1 when average TARRS is more than $$10,000^{14}$

c) =2 when average TARRS is more than $$17,000^{15}$

6) Department of Corrections (DOC) status:

a) =0 when no DOC record

b) =1 if DOC record

¹³ Initial debt less than \$8,000 was used for Dec07 NCPs.

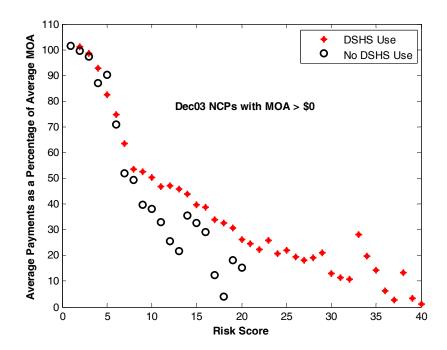
¹⁴ Initial debt more than \$8,000 was used for Dec07 NCPs.

¹⁵ Initial debt more than \$15,000 was used for Dec07 NCPs.

The average risk scores for the four labeled strata in Figures 2.2 and 2.4 flow diagrams are given in Tables 2.2 and 2.4.

Figure 4.6 presents percentage payment on MOA for in-state NCPs with MOA more than \$0, comparing NCPs with and without DSHS use (strat 1 and strat 2, respectively). At low risk scores the results are nearly identical for the two groups, but at risk score of around 7, NCPs with no DSHS service use begin to show a lower percentage payment than NCPs with DSHS use. While Table 2.2 showed that strat 2 NCPs on average paid a higher percentage of MOA than strat 1 NCPs, this is because strat 2 NCPs generally have lower risk than strat 2 NCPs (3.7 vs. 10.8 from Table 2.2). The relationship of payment on MOA and risk score for Dec05 NCPs is similar to that of Dec03 NCPs even though at low risk, payments as a percentage of MOA are a little higher than seen in Dec03 NCPs (Figure 4.7).





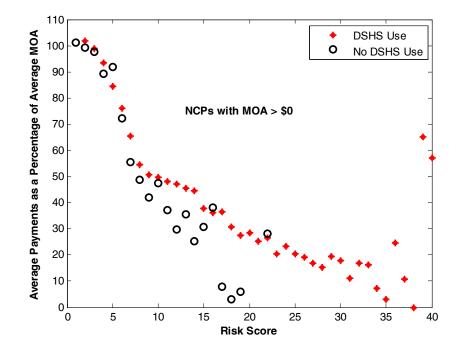


Figure 4.7: Payment on MOA Is Related to Risk Score for Dec05 Strat 1 & Strat 2 NCPs

The consequences of the reduction in percent payment for strat 2 NCPs are seen in Figure 4.8 where arrearage growth over the 48 months for strat 1 NCPs levels off at under \$5,000 as risk score increases, while arrearage growth for strat 2 NCPs continues to climb to over \$40,000 as risk score increases. This trend also holds true for Dec05 NCPs (Figure 4.9).

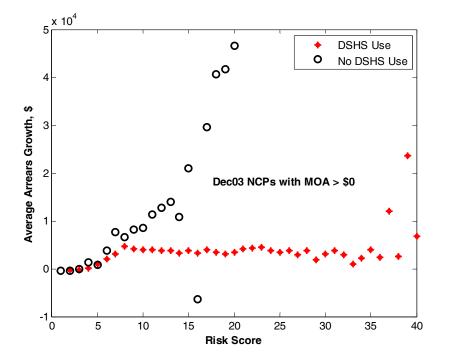


Figure 4.8 Arrearage Growth Is Related to Risk Score for Dec03 Strat 1 & Strat 2 NCPs

Figure 4.9: Arrearage Growth Is Related to Risk Score for Dec05 Strat 1 & Strat 2 NCPs

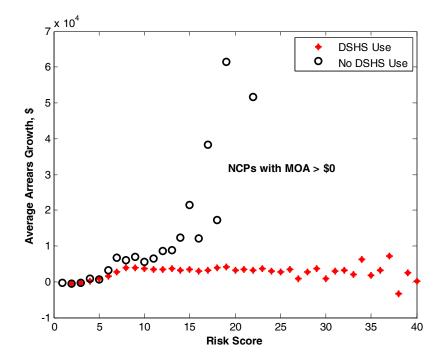


Figure 4.10 shows that as risk score increases MOA for strat 1 NCPs decreases but MOA for strat 2 NCPs generally increases.

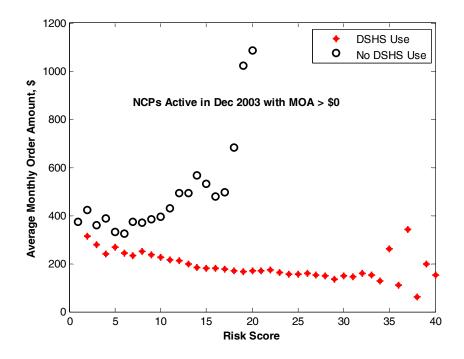


Figure 4.10: MOA Is Related to Risk Score for Dec03 Strat 1 & Strat 2 NCPs

However, as Figure 4.11 shows, earnings levels are lower for strat 2 NCPs at comparable risk scores, except for one data point at risk score 19 (the lowest risk score is 2 in strat 1 so there is no comparison for risk score 1 in strat 2).

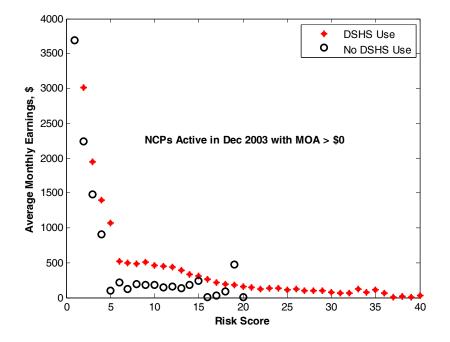
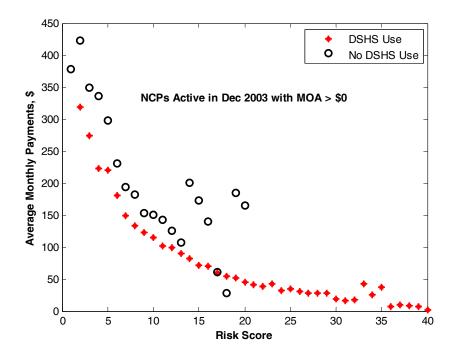


Figure 4.11: Earnings Are Related to Risk Score for Dec03 Strat 1 & Strat 2 NCPs

Figure 4.12 shows that payment amounts by strat 2 NCPs are higher than payments by strat 1 NCPs but payments are not enough higher to meet substantially higher MOAs. But since earnings are lower in strat 2 these NCPs are paying a higher portion of earnings towards child support than comparable risk NCPs in strat 1.



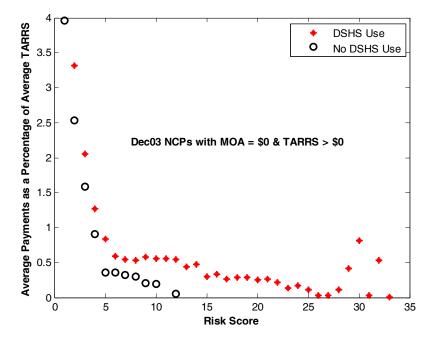


This may suggest that the child support system is accommodating hardships for NCPs with DSHS use by setting lower MOAs, but not recognizing hardships for NCPs with no use of DSHS. Since there are 49,536 strat 2 NCPs with risk score 5 or higher this could be a serious problem. For strat 2 NCPs with risk score 5 or higher the total initial debt was \$434.5 million and the total debt growth over the 48 month period was \$140.8 million. This totals to \$575.3 million at the end of the 48 months and may be mostly uncollectible debt, or, at best marginally collectible debt.

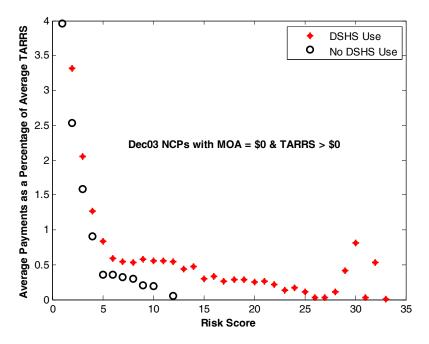
When we compare the components of risk score for strat 1 and strat 2 NCPs with risk score between 5 and 14, strat 1 NCPs gain a higher risk score mainly by increasing the number of DSHS report groups accessed, but strat 2 NCPs gain a higher risk score by increasing risk in all other risk components.

For strat 3 and strat 4 NCPs, since no current support is due, we use payments as a percentage of average TARRS to measure payment outcomes. In Figure 4.13, at comparable scores, percent payment is always lower in strat 4 (the lowest risk score is 2 in strat 3 so there is no comparison for risk score 1 in strat 4). Figure 4.14 shows the similar trend for Dec05 NCPs.

Figure 4.13: Payment on Debt Is Related to Risk Score for Dec03 Strat 3 & Strat 4 NCPs







However, as Figure 4.15 shows, the level of debt paid off by strat 3 NCPs does not change much with risk score, but strat 4 NCPs actually pay off more debt as risk score increases. Above risk score 7 for strat 4 NCPs the data points may not be meaningful because of the low numbers of NCPs. While strat 4 NCPs are paying a smaller percentage of debt than strat 3 NCPs, their debt is much larger. This is why they can be paying a smaller percentage but a larger amount. Similar trend for Dec05 NCPs is shown in Figure 4.16.

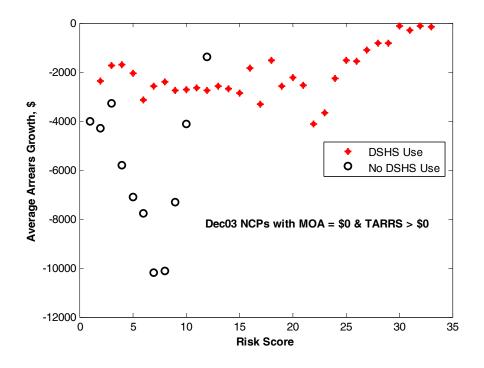


Figure 4.15: Arrearage Growth Is Related to Risk Score for Dec03 Strat 3 & Strat 4 NCPs

Figure 4.16: Arrearage Growth Is Related to Risk Score for Dec05 Strat 3 & Strat 4 NCPs

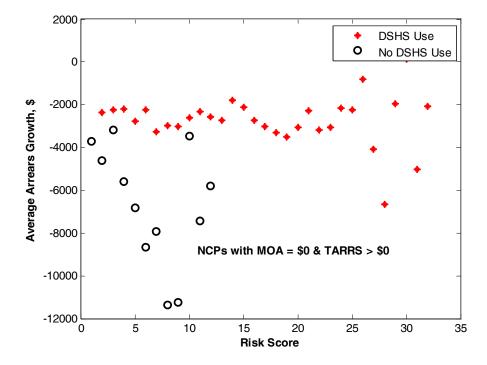


Figure 4.17 shows that average debt levels off for strat 3 NCPs but continues to increase for strat 4 NCPs as risk score increases. Strat 4 average debt becomes over three times strat 3 average debt.

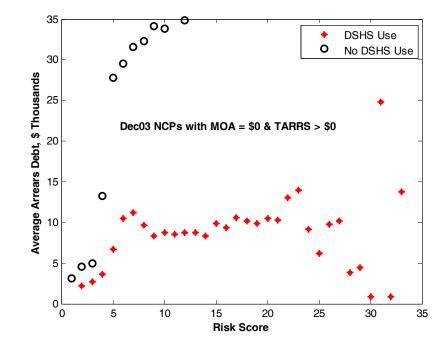


Figure 4.17: Average Debt Is Related to Risk Score for Dec03 Strat 3 & Strat 4 NCPs

In Figure 4.18 we see that average earnings at comparable risk score are lower for strat 4 NCPs, except for the data point at score 9.

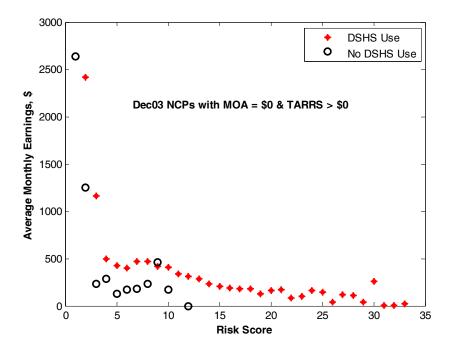
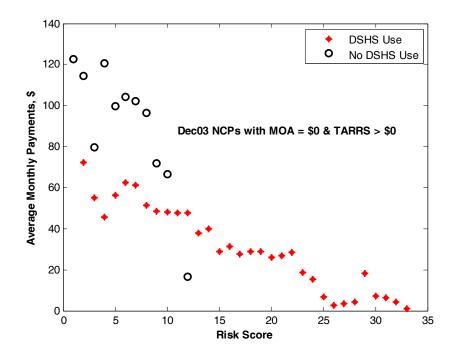


Figure 4.18: Earnings Are Related to Risk Score for Dec03 Strat 3 & Strat 4 NCPs

But in Figure 4.19 we see that payments at comparable risk score are higher for strat 4 than for strat 3, except for the final strat 4 data point.





Our risk score is potentially very useful in managing child support arrearage debt. In the analysis presented above risk score has allowed us to identify high risk NCPs in strat 2 whose circumstances may suggest the necessity of a downward modification of current support. The risk score can also identify NCPs where a more aggressive collections approach may improve payment outcomes.

5 Spells of Arrearage Change

This section will examine another NCP characteristic, payment pattern, through checking their spells of arrear change¹⁶. The timing of payments is critically important for custodial family well-being—children must be fed and cared for every day. Stable and dependable support payments can help custodial families build stability into their lives. Our past work has shown that greater custodial family self-sufficiency and cost avoidance in other areas of public support programs can be attributed to full regular payments of child support (Formoso, Liu, & Welch, 2008; Formoso, 2007; Formoso, 2004). Reductions in costs for Medicaid, Food Stamps, and TANF attributable to full regular payments of child support for custodial families were estimated to be \$114 million in SFY07 (July 2006 to June 2007). In Washington State, cost avoidance has been larger than cost recovery from retained support since SFY01. From a social service point of view the timing of payments may be more important than the amount collected. For NCPs we look at spells of arrearage change and determine periods of time with beneficial payment patterns and periods of time with detrimental payment patterns.

In our original study of arrearage growth (Formoso, 2003) we looked at spells of arrearage change and determined the duration as well as debt change of each spell. We found that the most common spell sequences were alternating spells of increasing debt and decreasing debt. For Dec03 NCPs 79% of spells of increasing debt are terminated by a spell of decreasing debt, and 61% of spells of decreasing debt are terminated by a spell of increasing debt. For Dec05 NCPs 80% of spells of increasing debt are terminated by a spell of decreasing debt, and 53% of spells of decreasing debt are terminated by a spell of decreasing debt, and 53% of spells of decreasing debt are terminated by a spell of decreasing debt.

Table 5.1 compares debt change exhibited by Dec03 and Dec05 NCPs. The cohort of 95Q3 NCPs¹⁷ are also included to show the spell of debt change over the time. The debt increase due to spells of increasing debt are not very different in the three time periods, but the debt decrease due to spells of decreasing debt provide a larger offset to debt growth in the two later periods. Even though the study period is longer for Dec03 and there are more NCPs total debt growth is considerably smaller than for the 95Q3 study. There are even more NCPs in the Dec05 study but total debt growth is smaller than in the Dec03 study.

¹⁶ Month-to-month differences in total arrears debt (TARRS) are calculated and assigned to spells of increasing debt, spells of no debt change, spells of decreasing debt, or undetermined spells. Spells of undetermined debt change occur when the NCP has no open case in a month or series of months.

¹⁷ NCPs selected from all active cases in 3rd calendar quarter of 1995 in the V1 study.

	95Q3*	Dec03	Dec05
# NCPs	241,575	259,412	272,581
# Study Months	45	48	48
Debt Change for Increase Spells, Million \$	\$1,134	\$1,297	\$1,267
Debt Change for Decrease Spells, Million \$	-\$592	-\$989	-\$1,021
Total Debt Change, Million \$	\$543	\$309	\$246

* see Formoso, 2003

Next we look at spell structure for Dec03 NCPs in each of the strata. Table 5.2 compares spells in strat 1 and strat 2 (NCPs with current support due, with/without use of other public services) while Table 5.3 compares spells in strat 3 and strat 4 (NCPs with arrearage debt, no current support due, with/without use of other public services). During the same study period, NCPs in strat 1 spent total 1,714,113 months, or average 22.4 months, in spells of increasing debt while NCPs in strat 2 spent total 1,540,850 months, or average 15.9 months, in spells of increasing debt. Therefore, total debt increase for strat 2 NCPs are \$93 million, or 40.5%, less than the total debt increase for strat 1 NCPs. For arrear only NCPs (strat 3 and strat 4), debt change primarily refers to debt decrease. Strat 4 NCPs spent 23.3 months on average in spells of decreasing debt compared with the average 17.7 months for strat 3 NCPs. Thus, the total debt decrease for strat 4 NCPs are \$22 million, or 71.0%, more than the total debt decrease for strat 3 NCPs.

 Table 5.2: Spell Structure for Dec03 NCPs in Strat 1 & Strat 2

Suati							
Spell Type	Avg Time,		# Spells		Total Debt	Debt	Debt
	Months	# NCP		Spells/NCP	Change,	Change	Change
	wonths				Million \$	per NCP, \$	per Spell, \$
All Decrease	2.81	68,504	296,460	4.3	-\$304	-\$4,431	-\$1,024
All No Change	4.81	58,454	151,205	2.6	\$0	\$0	\$0
All Increase	5.72	76,652	299,831	3.9	\$531	\$6,922	\$1,770
All UnDetermined	12.08	31,650	39,664	1.3	\$0	\$0	
All Spells	4.77	78,228	787,160	10.1	\$227	\$2,902	\$288

strat 2

etrat 1

Spell Type	Avg Time, Months	# NCP	# Spells	Spells/NCP	Total Debt Change, Million \$	Change	Debt Change per Spell, \$
All Decrease	2.74	92,988	476,307	5.1	-\$413	-\$4,443	-\$867
All No Change	6.35	88,729	268,353	3.0	\$0	\$0	\$0
All Increase	3.32	96,552	464,567	4.8	\$548	\$5,680	\$1,180
All UnDetermined	12.12	40,190	47,709	1.2	\$0	\$0	
All Spells	4.08	106,827	1,256,936	11.8	\$135	\$1,266	\$108

sual 5								
Spell Type	Avg Time,		# Spells		Total Debt	Debt	Debt	
	Months	# NCP		Spells/NCP	Change,	Change	Change	
	wonuns		Million \$	per NCP, \$	per Spell, \$			
All Decrease	5.02	10,586	37,338	3.5	-\$44	-\$4,169	-\$1,024	
All No Change	6.45	12,013	44,127	3.7	\$0	\$0	\$0	
All Increase	1.02	4,341	4,698	1.1	\$14	\$3,113	\$1,770	
All UnDetermined	13.79	6,183	8,273	1.3	\$0	\$0		
All Spells	6.26	12,311	94,436	7.7	-\$31	-\$2,487	-\$324	

strat 4

etrat 2

Spell Type	Avg Time, Months	# NCP	# Spells	Spells/NCP	Total Debt Change, Million \$	Change	Debt Change per Spell, \$
All Decrease	5.87	10,240	40,643	4.0	-\$66	-\$6,470	-\$1,630
All No Change	4.85	10,661	43,231	4.1	\$0	\$0	\$0
All Increase	1.02	2,946	3,217	1.1	\$13	\$4,556	\$4,172
All UnDetermined	13.45	5,263	6,478	1.2	\$0	\$0	
All Spells	5.76	11,222	93,569	8.3	-\$53	-\$4,708	-\$565

The difference in total debt change by strata can be explained by the spell structure and the time spent on the different type of spells (Figure 5.4). For strat 1 and strat 2 NCPs with current support due, spells with no change in debt indicate that full payment on current support has been made; thus both spells of decreasing debt and spells with no debt change can be considered beneficial, while spells with increasing debt are detrimental. The ratio of beneficial to detrimental spells is 1.49 for strat 1 NCPs and 1.60 for strat 2 NCPs. When we include the time factor the difference between strat 1 and strat 2 becomes more dramatic. The total time the group spends in a particular spell type is obtained by multiplying the average time by the number of spells. Strat 1 NCPs spend 41.6% of total spell time in beneficial spells, with 0.91 as the ratio of beneficial time to detrimental time. The corresponding numbers for strat 2 NCPs are 58.7% and 1.95. Strat 2 NCPs spend relatively more time in beneficial payment behaviors and relatively less time in detrimental payment behaviors.

Table 5.4 Beneficial to Detrimer	tal Time Ratio by	Strata, Dec03 NCPs
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	Strat 1	Strat 2	Strat 3	Strat 4
% Beneficial Spells	56.9%	59.2%	39.5%	43.4%
% Detrimental Spells	38.1%	37.0%	51.7%	49.6%
Beneficial Spells/Detrimental Spells	1.49	1.60	0.76	0.88
% Beneficial Spell Time	41.6%	58.7%	31.7%	44.3%
% Detrimental Spell Time	45.6%	30.0%	49.0%	39.5%
Beneficial Spell Time/Detrimental Spell Time	0.91	1.95	0.65	1.12

For strat 3 and strat 4 NCPs, spells of no debt change can be considered detrimental because no current support due and no debt change implies no payments. Even though there is no current support due some spells of increasing debt arise by other means. Only spells of decreasing debt can be considered beneficial in these two strata. The ratio of beneficial to detrimental spells is 0.76 for strat 3 and 0.88 for strat 4.

As we saw above for strat 1 and strat 2, when we include the time factor there is a more dramatic difference between strat 3 and strat 4 NCPs. Strat 3 NCPs spend only 37.1% of total spell time in spells of decreasing debt where strat 4 NCPs spend 44.3% of total spell time in spells of decreasing debt. The ratio of beneficial to detrimental time in strat 3 is 0.65 where in strat 4 it is 1.12. So in strat 3, time spent in detrimental payment behavior predominates. In strat 4, time spent in beneficial payment behavior slightly exceeds detrimental payment behavior. We next combine this approach with risk score and show how the beneficial/detrimental ratios vary with risk score. Since the time ratio shows more dramatic differences we do not show the ratio of number of spells.

Figure 5.1 presents the variation in the ratio of total beneficial time to total detrimental time with risk score. Risk score shows a big effect on the time ratio in all strata. Strat 2 shows the largest change with the time ratio dropping from 3.9 at risk score 1 to 0.2 at risk score 12. This means that time spent in beneficial payment behavior drops from almost four times that spent in detrimental payment behavior to one-fifth of the time spent detrimental payment behavior. Strat 1, 3, and 4 show an initial drop in the time ratio followed by a more gradual decline. This is less clear for strat 4 where there are few data points and the results appear more erratic. An interesting feature of Figure 6.1 is the similarity of response in the time ratio for all strata as risk score increases.

Figure 5.1: The Relation of Time Ratio Beneficial/Detrimental Spells to Risk Score by Strata, Dec03 NCPs

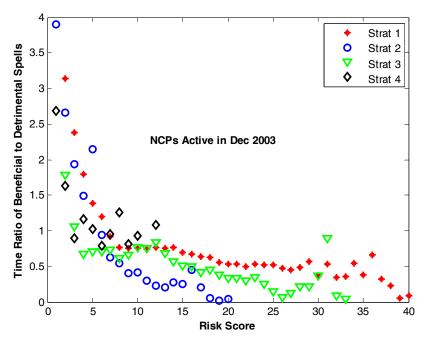
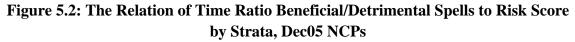
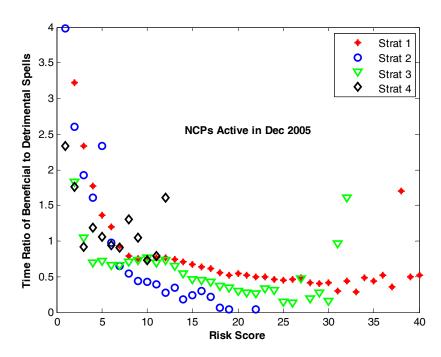


Figure 5.2 reproduces the relationships between risk score and time ratio for the Dec05 NCPs with virtually identical results.





This section examined spells of arrear change by risk score in order to show the importance of payment regularity in addition to payment amount. The ratio of beneficial over detrimental spell time is another important NCP characteristic which could help to identify NCPs with different level of risks of poor payment outcome, and therefore to develop specified debt management strategies.

6 Testing Practical Application

In this section, we assess how well the stratification procedure would work in practice by analyzing data that would be available to DCS as of January 2008 to characterize NCPs by strata and risk score. We evaluate this characterization using data on actual payment data from 2008. For historical information of Dec07 NCPs, the analysis uses DCS data from January 2006 to December 2007. We assume a lag in CSDB production and use CSDB data from SFY03 through SFY06. This allows us to form the basic stratification flow using only current and historical data and including all NCPs with active cases in December 2007. We use wage data from 3rd calendar quarter of 2005 to 2nd calendar quarter of 2007, assuming a 2-quarter lag. Incarceration data includes all DOC records before January 2008.

The stratification and risk score are based on December 2007 current and historical data, but outcomes will be based on data in the 12 month period future to December 2007. This is similar to the treatment of Dec03 and Dec05 NCPs where we used two years of data prior to the selection month, but for those NCPs we also included two years of data after the selection date to establish patterns. The biggest difference with Dec07 NCPs is that at the time data was obtained for Dec07 NCPs we did not have data for the full 24 months after December 2007 and we restricted data to 12 months after December 2007.

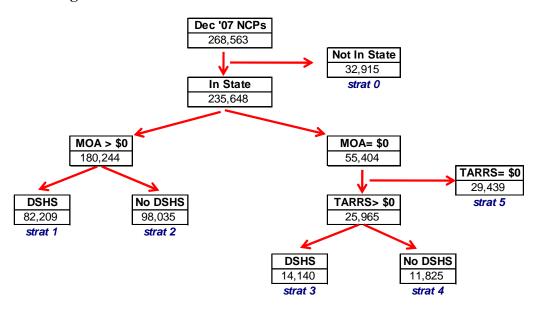




Figure 6.1 shows the stratification flow for NCPs active in December 2007 based on current and historical DCS and CSDB data. Since we are using only two years of DCS data here, the sorting of NCPs is somewhat different than seen for December 2003 and December 2005 NCPs where we used four years of DCS data. In this stratification relatively more NCPs have MOA=\$0 and relatively more NCPs have no payment obligation. This is because locating NCPs and setting support orders may take a long time for some cases, but we only have two years of data for Dec07 NCPs compared to four years of data for Dec03 and Dec05 cohorts.

Table 6.1 shows the characteristics of Dec07 NCPs in each of the four strata.

Dec07	strat 1	strat 2	strat 3	strat 4
Number of NCPs	82,209	98,035	14,140	11,825
Monthly Order Amount (MOA)	\$236	\$408	\$0	\$0
Payment	\$141	\$333	\$50	\$102
Wages	\$792	\$1,756	\$439	\$625
Total Arrear Amount (TARRS)	\$9,345	\$6,047	\$11,491	\$13,844
Debt Growth	\$1,703	\$809	-\$1,367	-\$2,348
Share of NCPs with MOA>20% of wages	69.6%	61.0%	0.0%	0.0%
Share of NCPs with wages<\$1,400	79.0%	57.5%	88.7%	82.1%
Payment/MOA	59.8%	81.5%		
Payment/TARRS			0.4%	0.7%
Risk Score	10.6	3.7	10.1	3.5

 Table 6.1: Stratified Characteristics of December 2007 NCPs

With stratification and risk score based on data prior to January 2008 Figures 6.2 - 6.10 present payment and arrearage outcomes from January 2008 to December 2008. The figures retain only data points with more than 20 NCPs.

Figure 6.2 shows payments as a percentage of MOA (over calendar year 2008) for strat 1 and strat 2, with a slightly different appearance than Figures for Dec03 and Dec05, but with the same essential features. For low risk scores, strat 1 and strat 2 NCPs have nearly identical variation with increasing risk. At about risk score 7, payments as a percentage of MOA for strat 2 NCPs begin a sharper decline with increasing risk than do payments by strat 1 NCPs.



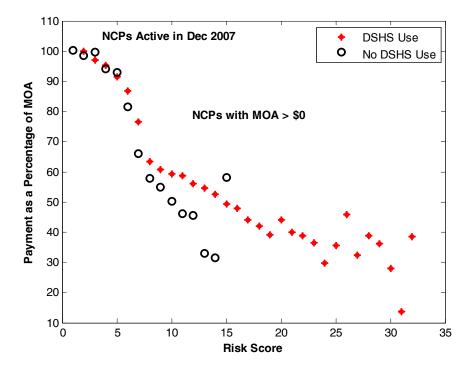


Figure 6.3 shows the variation in the 12-month sum (over calendar year 2008) of MOA as risk score increases. Strat 1 MOA sum continually decreases as risk increases, but the strat 2 MOA sum sharply increases after an initial decrease. For strat 1 NCPs, risk scores higher than 7 primarily come from NCPs with multiple child support cases, and NCPs with multiple cases tend to have higher MOA. At the final strat 2 data point strat 2 MOA is about three times strat 1 MOA.

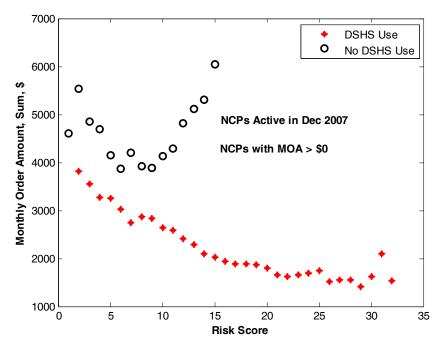
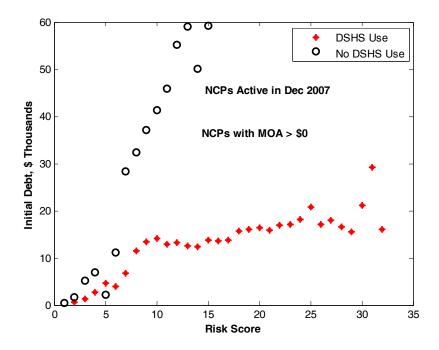


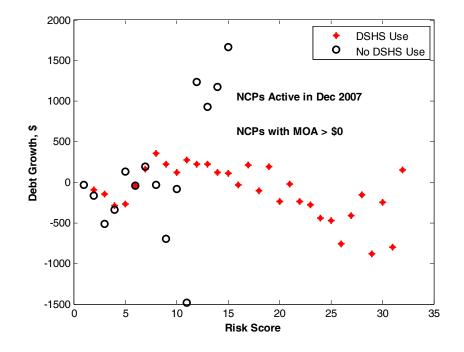
Figure 6.3: MOA Is Related to Risk Score for Dec07 Strat 1 & Strat 2 NCPs

The initial debt (TARRS in Dec07), which reflects past payment patterns shows a steady increase with risk score for strat 2 in Figure 6.4, while initial debt for strat 1 begins to level off at about risk score 10. Our research suggests that for strat 2 NCPs at higher risk scores, payments could not meet the high MOA, and debt accumulated.





However, debt growth over calendar year 2008 in Figure 6.5 for strat 2 shows a somewhat different behavior to that seen in the past (compare with Figure 4.8). From risk scores 8 to 11 more debt is paid down as risk increases, but risk scores 12 to 14 show a large increase in debt. Since data points are restricted to 20 or more NCPs we believe the points are reliable. Strat 1 debt growth changes with increasing risk score are similar to those seen with Dec03 and Dec05. Debt changes are smaller here because they are evaluated over a 12 month period instead of a 48 month period.





The variation of initial debt (debt in Dec '07) with risk score for strat 3 and strat 4 is shown in Figure 6.6. Initial debt for strat 3 levels off at risk score 6, while initial debt for strat 4 continues to increase to over three times that of strat 3. This again most likely reflects the patterns similar to those uncovered in our analysis of Dec03 and Dec05 NCPs. NCPs without DSHS use have increasing MOA as risk increases, payments cannot meet the MOA, and debt accumulates.

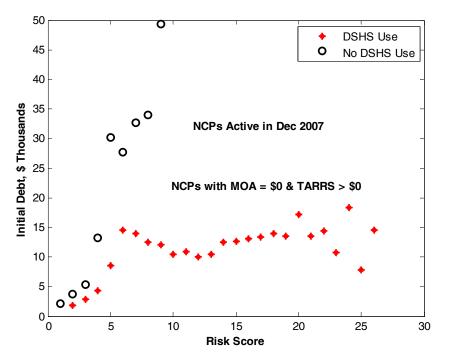


Figure 6.6: Initial Debt Is Related to Risk Score for Dec07 Strat 3 & Strat 4 NCPs

Figure 6.7 shows total payments in calendar year 2008 for strat 3 and strat 4 NCPs as a percentage of initial arrearage debt. It is also very similar to charts seen in past work. There is a sharp initial declining trend as risk score increases with strat 3 NCPs paying a higher percentage of debt at comparable risk scores.



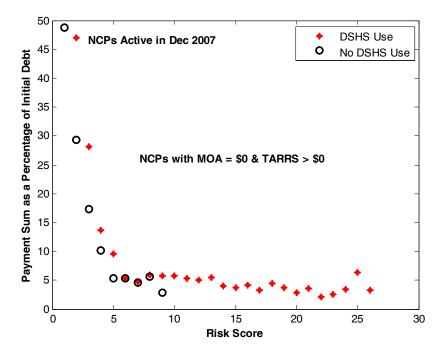
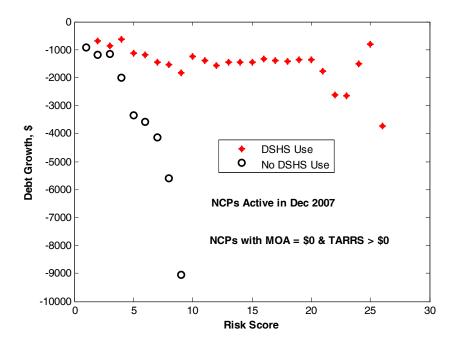
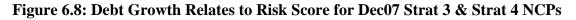


Figure 6.8 shows the debt paid off in strat 3 and strat 4 as risk increases. It is similar to charts seen in past work except we do not see a sharp upturn (reduction in debt paid) for strat 4 NCPs at higher risk.





In Figure 6.1 out-of-state NCPs were labeled as strat 0 and NCPs with no obligation were labeled as strat 5 so that we could compare characteristics derived from data up to December 2007 with characteristics derived from data after December 2007. In Table 6.2 strat 0 NCPs past use of other DSHS services is very low (9.2% of NCPs) compared to in-state NCPs and the vast majority of strat 0 NCPs have no past ESD earnings, indicating a minimal historical association with Washington state residence. Only 2.7% strat 0 NCPs show ESD earnings in calendar year 2008, suggesting that minimal Washington residence continued in the outcome period. Note that before/after values may differ because the before period is two years, but the after period is one year.

In the before period all NCPs in strat 1 and strat 2 had MOA > \$0 and all NCPs in strat 3 and strat 4 had MOA = \$0. Very low percentages of strat 3 and strat 4 NCPs (3.7% and 2.7%) have acquired a current support obligation in the after period, suggesting a high degree of stability in this classification. The classification of strat 1 and strat 2 NCPs is somewhat less stable with only \$7.1% and \$2.0% retaining a current support obligation in the after period.

The least stable classification appears to be NCPs with no obligation, where Table 6.2 shows that 24.5% do have a current support obligation in the after period.

strat	0	1	2	3	4	5
# NCPs	32,915	82,209	98,035	14,140	11,825	29,439
% with DSHS Use	9.2%	45.	6%	54.	5%	34.6%
% with Wage>\$0, 24 mos. Prior	4.4%	71.8%	64.3%	54.1%	39.9%	46.6%
% with Wage>\$0, 12 mos. After	2.7%	56.2%	56.8%	39.6%	33.7%	38.0%
% with MOA>\$0, 24 mos. Prior	56.8%	87.1%	92.0%	3.7%	2.7%	24.5%
% w Payment>\$0, 24 mos. Prior	70.2%	82.3%	91.4%	74.0%	82.4%	0.7%
% with Payment>\$0, 12 mos. After	64.2%	75.4%	88.7%	64.0%	73.2%	19.0%

Table 6.3 focuses on the outcome period – calendar year 2008. The yearly sums of payments, current support, and wages are given. Relatively more strat 1 NCPs have a high burden of current support and low earnings than strat 2 NCPs. The chances of NCPs with debt increase are higher in strat 1 than in strat 2 (46.3% vs. 31.8%). For strat 1 NCPs the time spent in beneficial payment behavior is about the same as that spent in detrimental payment behavior (ratio 1.08), but strat 2 NCPs spend over twice as much time in beneficial payment behavior than in detrimental payment behavior (ratio 2.27).

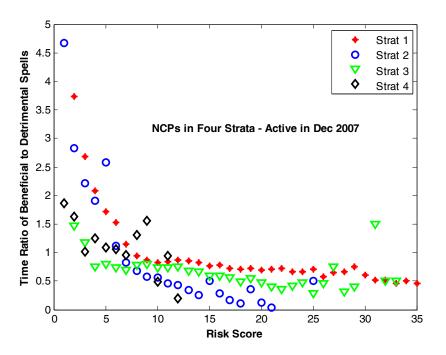
In strat 3 and strat 4 there is only a small difference in the percentage of NCPs with decreasing debt (70.7% vs. 77.9%), but strat 3 NCPs spend more time in detrimental payment behavior (ratio 0.71) while strat 4 NCPs spend more time in beneficial payment behavior (ratio 1.17).

Strat	1	2	3	4
# NCPs	82,209	98,035	14,140	11,825
Sum of Payment, post 12 months	\$1,846	\$4,126	\$626	\$1,197
Sum of MOA, post 12 months	\$2,629	\$4,482	\$62	\$52
Sum of Wage, post 12 months	\$10,137	\$21,869	\$5,668	\$7,888
% NCPs with MOA>20% of Wages	61.8%	56.1%	2.5%	1.7%
% NCPs with wages<\$1,400	76.7%	58.4%	86.7%	81.4%
% NCPs with Debt Increase	46.3%	31.8%	3.8%	3.3%
% NCPs with Debt Decrease	40.8%	36.2%	70.7%	77.9%
% NCPs with Debt Unchanged	13.0%	31.9%	25.5%	18.8%
Beneficial/Detrimental Time Ratio	1.08	2.27	0.71	1.17

 Table 6.3: Summarizing Results for Dec07 NCPs Outcome Period: Jan – Dec 2008

Figure 6.9 shows how the time ratio of calendar year 2008 payment behavior changes as risk score increases. Figure 6.9 is similar to Figure 6.1 for Dec03 NCPs and Figure 6.3 for Dec05 NCPs. Strat 2 NCPs again have the most dramatic changes with the ratio dropping from 4.7 at risk score 1 to 0.3 at risk score 14. Once again all four strata show similar behavior in this chart, with beneficial payment time predominating at low risk score and detrimental payment time predominating at high risk score.

Figure 6.9: The Relation of Time Ratio Beneficial/Detrimental Spells to Risk Score by Strata, Dec07 NCPs

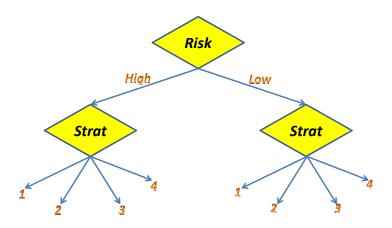


This section tested the developed stratification and risk score system by the cohort of Dec07 NCPs. It showed clear linkage of classification with historical data to NCP future payment behavior.

7 Practical Application of the Stratification Flow and Risk Score

The risk score allows the identification of NCPs with present or expected poor payment patterns. Combined with the stratification developed here this can lead to targeted strategies for improving payment patterns. Figure 7.1 represents a possible implementation of study findings: 1) Identify problems – such as large debt growth, low payments, low payments on current support, or low beneficial ratio; 2) Determine stratum and risk score; 3) Classify NCPs into high and low risk groups; 4) Use the NCP's stratum and actual risk factors to develop a strategy to mitigate the problem. For strat 1 and strat 3, we define NCPs as "low risk" if their risk scores are less than or equal to 4, and otherwise as "high risk." For strat 2 and strat 4, NCPs are low risk if their risk scores are less than or equal to 3, and high risk otherwise.

Figure 7.1: Strategic Flow for Implementation



Debt classification is important to manage existing debts efficiently. There are many ways to identify collectible and uncollectible debts using this system. We illustrate two of them in this section: debt growth method and beneficial/detrimental time ratio method.

7.1 Debt Growth Method

This method combines risk scores, debt growth amounts, and stratification to identify collectible and uncollectible debts. Low risk NCPs with large debt growth are most likely to have collectible debts. High risk NCPs with large debt growth would be most likely to have difficulties paying off their debts. The stratification flow and specific risks may be used to develop targeted strategies to mitigate the problems.

We will use the Dec03 NCPs to illustrate this approach. Figure 4.8 shows that average debt growth for Dec03 strat 1 NCPs levels off at under \$5,000. So we will consider that average debt

growth over \$5,000 during 48 month period as large debt growth for strat 1 and strat 2 NCPs. Table 7.1 shows the results for the selected low risk problem NCPs.

Strat 1			
Risk	# NCPs	Ratio of MOA	Total Debt
Score	# NCFS	To Wage	Growth, \$Million
2	69	12.1%	\$0.63
3	158	17.9%	\$1.51
4	321	27.1%	\$3.11
Totals	548		\$5.25
		Strat 2	
Risk	# NOD-	Strat 2 Ratio of MOA	Total Debt
Risk Score	# NCPs		Total Debt Growth, \$Million
-	# NCPs 327	Ratio of MOA	
Score		Ratio of MOA To Wage	Growth, \$Million
Score 1	327	Ratio of MOA To Wage 11.4% 20.1%	Growth, \$Million \$2.81

Table 7.1: Dec03 Low Risk NCPs with Debt Growth > \$5,000

Cturat 4

Ratio of MOA to Wage in Table 7.1 presents current support as a percentage of wages, which do not seem unreasonable expectations of payment. However, the table shows us 2,241 low risk NCPs accumulated a total of \$22.3 million debt growth that might have been avoidable. The results with Dec07 NCPs show that classification of NCPs with historical data does link to future results, so this approach could lead to interventions which could circumvent future debt growth. Interventions would have to be targeted based on the NCP's stratum and particular risk factors.

Figure 7.2 shows us the problem of high risk NCPs with large debt growth in strat 1 and strat 2. For strat 1 NCPs, current support due rises to just below 300% of wages on average, and for strat 2 NCPs, current support due rises to a staggering 500% of wages. These certainly are unreasonable expectations of payment. Here we identify 33,596 high risk NCPs with \$493.5 million in debt that might have been largely avoided by implementing appropriate order modifications and other mitigation strategies. Future debt growth could be better controlled under this situation if some early interventions such as order modification could be taken. Again, interventions would have to be targeted based on the NCP's stratum and particular risk factors.

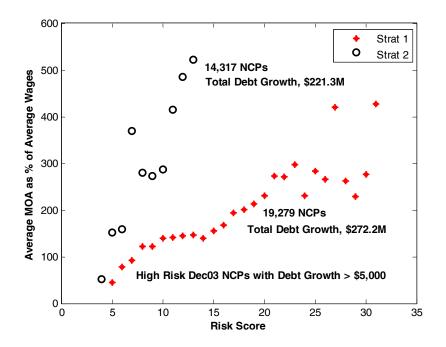


Figure 7.2 Dec03 High Risk NCPs with Debt Growth > \$5,000

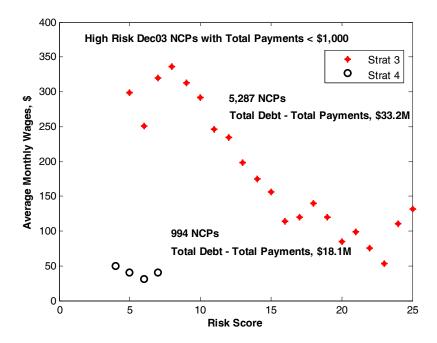
NCPs in strat 3 and strat 4 do not have current support due so basically their debt would not increase. We would consider NCPs who have paid less than \$1,000 over the 48 month period as low payment NCPs. Debts are more likely to be collectible for low risk NCPs with low payment but more likely to be uncollectible for high risk NCPs. Table 7.2 shows the results for low risk NCPs who have low risk scores which represent fewer barriers to make payment. Total debt in the table is the debt at the end of the 48 month study period. Payment of \$1,000 over a 48 month period means an average monthly payment of just under \$21 a month. It seems, from earnings, that NCPs with risk score 2 or 3 in strat 3 and NCPs with risk scores 1 or 2 in strat 4 should have been able to pay more than that. But most of the debt resides in risk score 4 in strat 3 and risk score 3 in strat 2, and paying even \$21 a month would be difficult with the earnings levels seen at those risk scores, especially for strat 4 NCPs with risk score 3. So while these 3,274 low risk NCPs have a total unpaid debt (total debt – total payments) of \$5.2 million, this is, at best, marginally collectible.

Strat 3					
Risk	# NCPs	Average	Total Debt	Total Payments	
Score	# NCF 5	Wages	\$Million	\$Million	
2	82	\$2,482	\$0.033	\$0.025	
3	228	\$1,187	\$0.24	\$0.09	
4	459	\$316	\$0.86	\$0.11	
Totals	769		\$1.13	\$0.23	
		Stra	t 4		
Risk Score	# NCPs	<mark>Strat</mark> Average Wages	Total Debt	Total Payments \$Million	
-	# NCPs 250			Total Payments \$Million \$0.11	
Score		Average Wages	Total Debt \$Million	\$Million	
Score 1	250	Average Wages \$2,593	Total Debt \$Million \$0.15	\$Million \$0.11	

Table 7.2 Dec03 Low Risk NCPs with Payments < \$1,000

The situation for high risk NCPs in strat 3 and 4 is shown in Figure 7.3. The earnings level is so low that even paying \$21 a month would be difficult for most of these NCPs. While these 6,281 NCPs have \$51.3 million debt remaining at the end of 48 months, collections can be expected to be very low here.

Figure 7.3 Dec03 High Risk NCPs with Payments<\$1,000



In the above examples, we identify 5,515 noncustodial parents where improvements may be possible with a more aggressive collections approach. At the end of study period, these NCPs owed total \$31.4 million arrears in which \$19.4 million was owed to CP and \$10.1 million was owed to DSHS. These noncustodial parents owe child support to 5,744 custodial families and 8,684 children. We also identify 39,877 noncustodial parents where reevaluations and revisions appear necessary to manage and mitigate arrears debt. These noncustodial parents owed total \$978.1 million arrears in which \$507.5 million was owed to CP and \$386.9 million was owed to DSHS. These noncustodial parents owe child support to 62,313 custodial families and 83,015 children.

Dec03 NCPs ¹	Low Risk	High Risk
Total number of NCPs	5,515	39,877
# of NCPs using other DSHS services	1,317	24,566
# of NCPs not using other DSHS services	4,198	15,311
Total number of custodial families involved	5,744	54,116
Total number of children involved	8,684	71,192
Total debts ²	\$31.4 Million	\$978.1 Million
Debts owed to custodial parents	\$19.4 Million	\$507.5 Million
Debts owed to DSHS	\$10.1 Million	\$386.9 Million
Collectability of debts	Avoidable, Collectible	Unavoidable, Uncollectible

Table 7.3 Identification of Low Risk and High Risk NCPs

Note:

1. Refers to strat 1 and strat 2 NCPs with debt growth over \$5,000, or strat 3 and strat 4 NCPs with payment less than \$1,000, during 48 month period.

2. Total debts owed by NCPs at the end of study period. Debts owed to custodial parents and debts owed to DSHS are not summed to total debts because there are some temporary assigned debts.

7.2 Time Ratio Method

Since the time ratio results appear to be the most consistent measure across the three groups of NCPs (Dec03, Dec05, and Dec07), we can also identify low risk Dec07 NCPs with low beneficial/detrimental time ratios. In Table 7.3 we include only NCPs with the lowest risk scores in each stratum (scores 2 and 3 in strat 1 and strat 3, scores 1 and 2 in strat 2 and strat 4). Table 7.3 is derived from the month-to-month time ratio recalculation for Dec07 NCPs.

	Number of NCPs with Lowest 2 Risk Levels			
	Total	Ratio>1.0	Ratio<0.5	
Strat 1	8,846	6,358	1,263	
Strat 2	39,306	30,943	4,048	
Strat 3	902	481	291	
Strat 4	2,286	1,346	623	
Total	51,340	39,128	6.225	

Table 7.3 Beneficial/Detrimental Time Ratios for Low Risk Dec07 NCPs

In strat 1 and strat 2 the vast majority of low risk NCPs are spending more of calendar year 2008 in beneficial payment patterns than in detrimental payment patterns (72% in strat 1 and 79% in strat 2). But 5,311 NCPs are spending more than twice as much time in detrimental patterns as beneficial patterns. In strat 3 and strat 4 slightly more than half of the low risk NCPs are spending more of calendar year 2008 in beneficial payment patterns than in detrimental payment patterns (53% in strat 3 and 59% in strat 4). And 914 NCPs are spending more than twice as much time in detrimental patterns as beneficial patterns. Overall this approach identifies 6,225 NCPs where focused casework could potentially improve payment outcomes.

Much of the information needed to implement these approaches would not be easily or directly available to case workers, and the necessary data processing is more easily done centrally. A web application could be developed where case workers could retrieve stratification, risk score, risk factors, and flagging for potential or existing problems for each NCP in their case load. Unfortunately, DCS cannot release the individual-level details of CSDB service use because of confidentiality restrictions in our data sharing agreements. But other detailed individual information could be included such as the number of CSDB report groups used, the total number of CSDB service events, the total cost of CSDB services, other risk factors, the historical percentage payment, and the historical time ratio of beneficial payment patterns to detrimental payment patterns. The proposed web application would augment caseworkers' understanding of their caseloads with an informative characterization of each NCP that is derived from analysis of the enormous amounts of data available to the DCS research staff.

8 Major Findings and Policy Implications

8.1 Major Findings

We summarize the major findings from our research, below:

- 1. Consistent with earlier work, we find that current support larger than 20% of an NCP's gross monthly earnings, or gross monthly earnings below \$1,400, corresponds to arrearage growth.
- 2. At equivalent levels of earnings and current support due, arrearage growth is generally larger for NCPs who have used other DSHS services. Below about \$3,000 gross monthly earnings, NCPs who have used other DSHS services have lower current support due than NCPs with similar incomes who have not used other DSHS services. But the service users also pay a smaller fraction of support due.
- 3. The vast majority of NCPs (over 80%) with arrearage debt who do not owe current support have gross monthly earnings below \$1,400, and their payments are typically very low. Earnings for these NCPs were likely also low when they had current support due, which would lead to the accrual of debt.
- 4. For Dec03 NCPs who only owe arrears, average monthly payments are less than one percent of average debt, suggesting that it would take about 100 months to pay off the debt on average. But there are 7,031, 30% of Dec03 arrears only NCPs, who only averaged paying \$2.16 monthly. The monthly payment of this group of NCPs was only about 0.03% of their debt and their final debt at the end of the 48 month period was \$44.4 million. We might expect this group to take about 300 months to pay off debt.
- 5. Combined with payment information, classifications of NCPs by stratum and risk score demonstrate a clear link to payment behavior. Evaluation of specific risk factors and the stratum of the noncustodial parent can lead to targeted strategies for improvements.
- 6. As risk score increases, earnings levels drop rapidly for both DSHS service users and nonservice users. For a given risk score, NCPs who have not used other DSHS services tend to have lower earnings than those who have used other services. On the other hand, current support decreases with risk for NCPs who were service users and increases for those who were not. The threshold risk score above which average current support exceeds 100% of average earnings is much higher for service users than for non-users.
- 7. For service users, higher risk scores typically correspond to use of many services, suggesting a greater variety of barriers to payment. For non-service users, the number of open cases is the key factor increasing risk because more cases typically correspond to greater current support due. These conclusions support our stratification based on service use.

8. The achievement of this study is that the stratification and risk score methodology allows the identification of high risk and low risk NCPs as well as collectible and uncollectible debts. Table ES.1 shows an example of identification results by using risk score system developed in the study. Among the NCPs with current support due and debt growth over \$5,000 within 48 months, we identified a total of 2,241 low risk NCPs whose debt growth reached \$22.3 million over the 48 months. This debt growth is very likely avoidable and collectible. From the same group of NCPs, we also identified a total of 33,596 high risk NCPs whose debt growth was \$493.5 million over the 48 months. As a group, their current support obligation exceeded their income – a situation not likely to bring in full current support payment–making the accrual of debt unavoidable and the resulting debt essentially uncollectible.

	Low Risk	High Risk
Total number of NCPs	2,241	33,596
# of NCPs using other DSHS services	548	19,279
# of NCPs not using other DSHS services	1,693	14,317
Total number of custodial families involved	2,430	54,116
Total number of children involved	3,685	71,192
Total debt growth	\$22.3 Million	\$493.5 Million
Collectibility of debts	Avoidable, Collectible	Unavoidable, Uncollectible

Table ES.1 Identification of Low Risk and High Risk NCPs*

* Refers to Dec03 NCPs with current support due and debt growth over \$5,000 within 48 months.

While significantly reducing the large existing debt load will not be easy, the findings and protocols developed in this study suggest a path to such reductions and to prevention of similar debt growth in the future.

8.2 Policy Implications

Common sense suggests that preventing debt accumulation is preferred to managing debt after it has been accrued. A 2004 report from the Office of Child Support Enforcement (OCSE) echoes this sentiment in practical terms, concluding that "the best ways to avoid the accumulation of arrears are to set appropriate orders initially, modify orders via simple procedures promptly when family circumstance change, and immediately intervene when current support is not paid." These steps seek to prevent debt accumulation that can quickly become unmanageable for the NCP. We recommend using our research to develop tools that support child support staff as they seek to achieve the following goals:

1. Develop case management strategies tailored to NCP characteristics.

Our study demonstrates the strong relationship between NCP characteristics and payment patterns. The risk score and associated data can provide caseworkers with a standardized method of identifying high- and low-risk NCPs, and of selecting the most appropriate debt management strategies for a given case. NCPs with poor payment histories but who are at low risk of accumulating arrears are the most promising targets for more aggressive collection efforts. NCPs with poor payment histories but who are at high risk of accumulating arrears are much less likely to be capable of meeting their current support obligations, let alone reducing their accumulated debt. The most appropriate debt management strategies for this group include order modification and writing off debt that is most likely uncollectible.

2. Set appropriate orders to prevent debt growth.

Arrearage growth typically occurs when current support due is more than 20% of NCPs' gross monthly earnings and when gross monthly earnings are below \$1,400. While these thresholds are approximate, they provide a useful baseline for setting more appropriate current support obligations. Specifically, we recommend exploring: (1) Updating the Washington State Child Support Schedule; (2) Reducing default orders; and (3) Incorporating more income information, such as unemployment compensation, Social Security benefits, and labor and industry compensation into the order setting process.

3. Modify orders promptly based on changes of family circumstance.

Changes in family circumstances, such as loss of employment, an increase in family size, NCPs being on public assistance or being incarcerated, are associated with arrearage growth. DCS should change the modification review criteria to encourage more timely order modification to control the accumulation of arrearage. Specifically, we suggest: (1) Programming the Support Enforcement Management System (SEMS) to automatically conduct "3-Year Cycle"¹⁸ modification reviews; (2) Adopting the following screening criteria to determine/define "substantial change in circumstances" which must be demonstrated for modification outside of the "3-Year Cycle": (a) Incarceration or release; (b) Documented disability of obligor lasting more than a year, or termination of disability; (c) Death of child in a case with multiple children; (d) Disability of a child; (e) Reasonable probability that adjustment of order will remove oblige from TANF; (f) Obligor arrears of \$3,000 or more.

¹⁸ DCS is required to do a modification review every 3 years for the cases currently on public assistance. This is called "3-Year Cycle".

4. Cooperate with other partners to help NCPs overcome their barriers.

Greater cooperation with DCS's partners, such as prosecutors, other DSHS administrations, and non-governmental partners may help DCS pursue the goals above. For example, at the time of the first paternity order, DCS should work with related partners to reach young, low-income men before they acquire multiple cases and multiple orders that they cannot pay.

While seeking ways to better manage debt, the emphasis must remain on prevention. Setting and maintaining accurate orders – orders based on actual income, taking into account significant barriers to collection within the case load – must be the highest priority.

Much of information used in this study is not easily accessible to case workers. But centralized data processing using existing databases and data warehouses could be used to transmit key data points to staff in the field through a web-based application. These would include details about each NCP's risk score and flagging of existing or potential problems.

The problems and trends identified in this report are not unique to Washington State. Consistent with the goals of OCSE's 1115 grant program, we believe our reported findings to be of value to other states with the technical infrastructure to develop approaches to NCP stratification and debt management strategies similar to those outlined in this report.

Appendix

Appendix I. Non-Analyzable Strata

A.I-1 Out-of-State NCPs

Out of 259,412 NCPs with active IVD cases in December 2003, there are 35,003 who resided out of Washington State. In order to include these out-of-state NCPs in the analysis, we attempted to retrieve more information about them from other sources such as the Federal Parent and Location Services (FPLS). The National Directory of New Hires (NDNH), a major component of the FPLS, is a national repository of employment, unemployment insurance, and quarterly wage information. The Federal Case Registry (FCR), another key component of the FPLS, contains incarceration information about persons in all child support cases being handled by state IV-D child support agencies. Unfortunately the historical data required for our analyses are neither complete nor easily accessible from either of these sources.

We also checked the Jail Booking and Reporting System (JBRS) for incarceration information on out-of-state NCPs. The JBRS only has currently incarcerated and historical booking data of some county jails from 30 states. In addition, it only supports single case searches and is very expensive for matching service on a large amount of data.

After checking the possible data sources for out-of-state NCPs, we determined that it would not be possible to include out-of-state NCPs in the analyses during the funding period due to cost, coverage and time constraints.

A.I-2 NCPs with No MOA and No TARRS

While this group of NCPs has no child support payment obligations, we briefly examined the Dec05 NCPs with no child support due and no arrears in the stratification flow chart. Among those 17,513 NCPs, most of them (over 97%) either have cases which are non-IVD cases, medical only cases, paternity establishment only cases, and locate cases requested by other states or have cases in the process of closing, establishing orders and paternity, and locating NCPs. We anticipate no further analyses with this group.

Appendix II. Use of Lagged CSDB Data

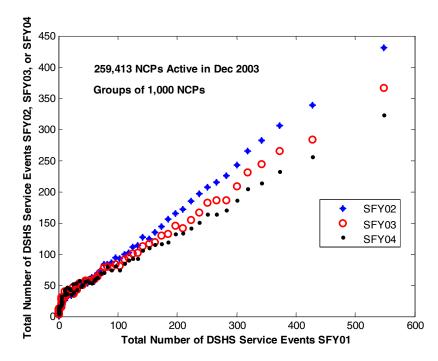
Data from the CSDB has appeared less useful than we might have hoped because of the extensive lag time. In SFY09 the latest CSDB data we had was for SFY06. To test the utility of lagged data we looked at a cohort of 259,412 NCPs from all active DCS cases in December 2003. CSDB data for this cohort was extracted for SFY01 to SFY04. Excluding DCS services Table A1 gives the total number of CSDB service events and total CSDB costs by SFY. Over the four years this cohort of NCPs used \$3.9 billion in services.

SFY	# NCPs	# Service Events	Total Cost
2001	56,687	6,266,534	\$882,630,000
2002	61,649	6,522,771	\$945,160,000
2003	63,548	6,696,183	\$1,006,600,000
2004	63,312	6,740,114	\$1,071,400,000
Total		26,225,602	\$3,905,790,000

 Table A.1 Service Event and Costs in Four SFY of Data from CSDB (Dec07 NCP)

The relationships of service events from year to year are seen in Figure A.1 where NCPs are ordered by total service events in SFY01 and averages are taken in groups of 1,000 NCPs. The chart shows near linear relationships of subsequent service use to service use in SFY01.

Figure A.1: Service Events in SFY02-04 Are Related to Service Events in SFY01



For service events the results of regression analysis on individual NCPs with $svc01^{19}$ as the independent variable are seen in Table A.2 where all parameter estimates have p < 0.0001. As we might expect, the relationship grows weaker with increasing time, but three years later it is still there.

Table A.2: Regression Analysis for Service Events in SFY02-04 Against Service Events in
SFY01

Dependent Variables	Parameter Estimates (svc01)	R ²
svc02	0.81	0.62
svc03	0.68	0.42
svc04	0.60	0.33

Note: svc01 - svc04 refers to the number of service events in SFY2001 - SFY2004

As part of other projects we are developing a neural network predictive model for cases at risk for poor payments. Recently we have included total SFY01 service events and costs as two of thirty-six candidate predictive factors. The procedure selected the twelve factors shown in Table A.3 as useful in predicting outcomes.

Input Factors	Definition
ARRSDSHS	Dec '03 arrearage owed to DSHS
cost	SFY01 total cost of DSHS services
days	Days since last payment
durp	Number of months with arears increase
durz	Number of months with no change in arrears
indtype	Indicator for case type of Dec03 NCPs
Isttarrs	Dec '03 total arrear amount
preATM	Estimator for number of missed payments
preFracPd	Fraction of current obligation paid
premoav	Indicator for MOA > \$0
pretarrsgro	Growth of total arrear amount
SVC	SFY01 total CSDB number of DSHS service events

Table A.3: Data from SFY01 is Useful in Predicting Payment Outcomes in SFY05

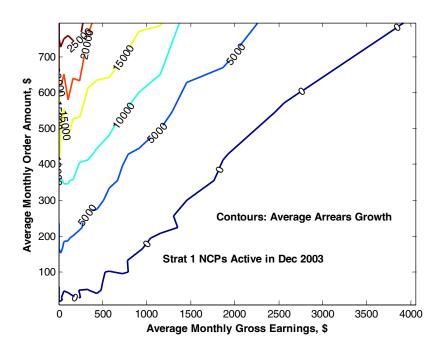
¹⁹ Svc01 – number of service events in SFY2001.

This preliminary model functions very well, making predictions for high risk that are 70% accurate and identifying 70% of the cases that are actually high risk. In this model CSDB SFY01 service use and cost data is useful in making individual case level predictions of payment outcomes in July to December 2004, the first six months of SFY05. CSDB data lagging by four years still contains important information.

All of these results suggest that while current CSDB data may be better, lagged CSDB data is a very useful substitute for current data.

Appendix III. Relationship of debt growth, earnings, and MOA for Dec03 NCPs Figures A.2 to A.10 show the relationship of debt growth, earnings, and MOA for Dec03 NCPs. These Figures are similar to Figures 3.1 to 3.9 which display the relationship for Dec05 NCPs. Through this comparison, we try to show that trends and conclusions are the same for Dec03 and Dec05 NCPs.





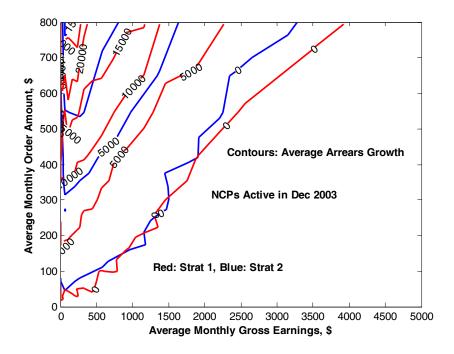
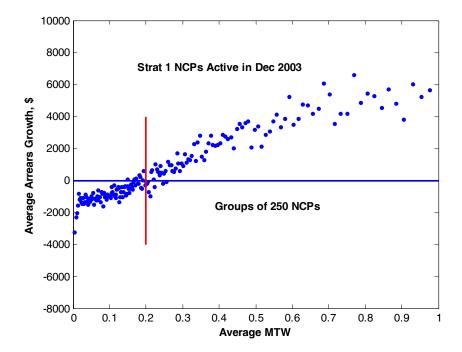


Figure A.3: Superimposed Contours of Debt Growth for Dec03 Strat 1 & 2 NCPs

Figure A.4: Debt Growth Relates to the MOA/Wages Ratio - Strat 1 Dec03 NCPs



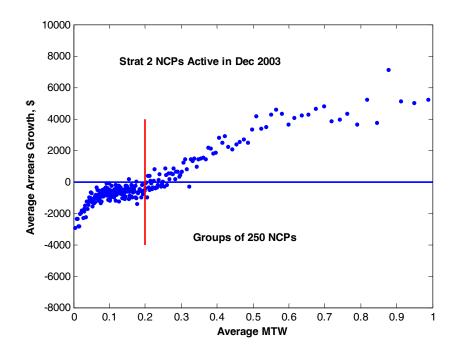
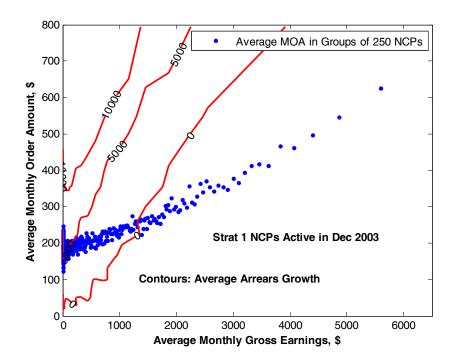


Figure A.5: Debt Growth Relates to the MOA/Wages Ratio – Strat 2 Dec03 NCPs

Figure A.6: Actual MOA and Contours of Debt Growth for Dec03 Strat 1 NCPs



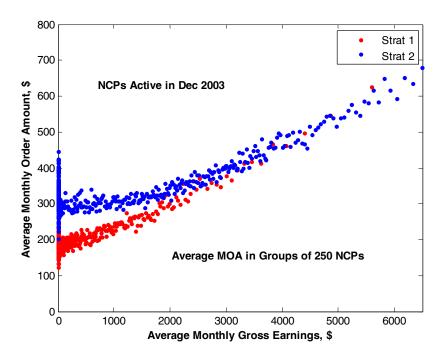


Figure A.7: Comparing Actual MOA for Dec03 Strat 1 & Strat 2 NCPs

Figure A.8: Comparing Percentage Payments for Dec03 Strat 1 & Strat 2 NCPs

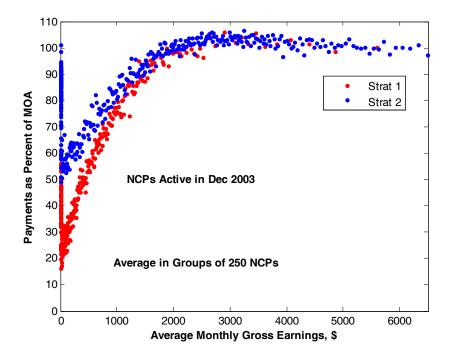


Figure A.9: Comparing Percentage of NCPs Where Payments Exceed 20% of Wages for Dec03 Strat 1 & Strat 2 NCPs

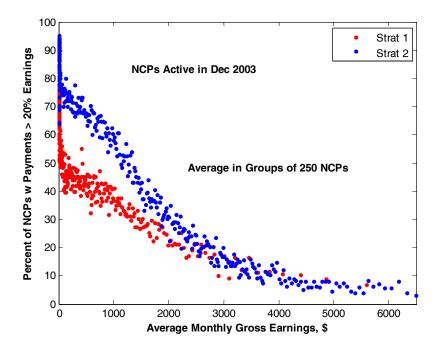
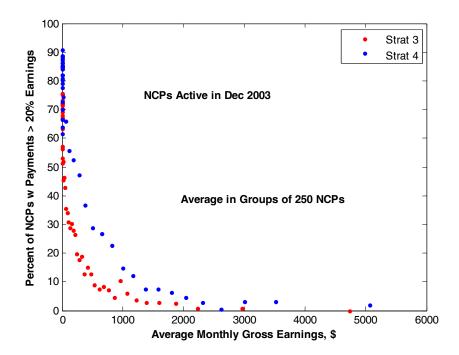


Figure A.10: Comparing Percentage of NCPs Where Payments Exceed 20% of Wages for Dec03 Strat 3 & Strat 4 NCPs



Appendix IV. Technical and Statistical Summary

A.IV-1 Contour Charts

The contouring algorithm works off of an underlying matrix of cells with approximately equal numbers of NCPs in each cell. Each cell contains an average value for arrears growth and is linked to values for MOA and earnings. For example, Figure A.3 for Dec03 strat 2 NCPs is based on a matrix of 208 cells. A portion of this matrix is shown in Table A.4 below with red numbers for the debt growth region.

	Average Monthly Gross Earnings										
	\$68	\$270	\$582	\$968	\$1,380	\$1,785	\$2,203				
\$25	-\$588	-\$1,174	-\$1,403	-\$1,649	-\$1,883	-\$2,852	-\$2,547				
\$71	\$660	-\$308	-\$524	-\$1,077	-\$1,310	-\$1,870	-\$2,554				
\$127	\$1,138	\$1,343	\$203	-\$793	-\$428	-\$1,878	-\$2,112				
\$174	\$3,778	\$2,678	\$1,346	\$355	-\$327	-\$981	-\$437				
\$209	\$3,881	\$2,397	\$1,596	\$652	-\$721	-\$806	-\$731				
\$242	\$4,728	\$3,314	\$2,446	\$541	-\$242	-\$808	-\$921				
\$272	\$5,037	\$3,298	\$2,225	\$1,144	\$101	-\$390	-\$1,004				
\$303	\$4,706	\$4,135	\$2,506	\$890	\$394	-\$885	-\$411				
\$339	\$5,673	\$4,652	\$2,605	\$2,239	\$353	-\$914	-\$815				
\$375	\$7,275	\$5,493	\$4,260	\$2,395	\$128	-\$649	-\$594				
\$420	\$7,286	\$7,064	\$4,580	\$2,885	\$888	\$276	-\$648				
\$476	\$7,661	\$6,592	\$5,719	\$4,318	\$1,296	\$190	-\$428				
\$547	\$9,758	\$10,626	\$7,004	\$5,065	\$2,026	\$945	\$129				
\$649	\$13,602	\$12,005	\$8,947	\$7,663	\$4,739	\$2,232	\$212				
\$850	\$16,124	\$15,239	\$11,955	\$9,888	\$8,145	\$4,598	\$2,878				

 Table A.4 A Portion of Underlying Matrix of Contour Charts

A.IV-2 Number of Cases

Figure 4.1 is based on the data shown in Table A.5 below.

Univariate regression analysis of percentage payment against number of cases at the individual level for combined strat 1 and strat 2 NCPs does not show a statistically significant relationship, but this is because division at the individual level produces large outliers. If we restrict percentage payment to values less than 500%, percentage payment relates to number of cases with strong statistical significance (prob F < 0.0001). The restriction eliminates only 2,275 out of 185,055 NCPs, just 1.2% of NCPs.

Strat 1 and Strat 2 combined											
# of Cases	# NCP	Avg	MOA	Avg	Pmt	Avg	Wages	MOA/Wages	Pmt/MOA		
1	139,604	\$	310	\$	264	\$	1,325	23.4%	85.2%		
2	28,444	\$	270	\$	196	\$	783	34.5%	72.3%		
3	9,493	\$	283	\$	169	\$	624	45.4%	59.6%		
4	4,098	\$	307	\$	158	\$	540	56.9%	51.4%		
5	1,764	\$	322	\$	140	\$	469	68.7%	43.3%		
6	849	\$	351	\$	148	\$	489	71.7%	42.2%		
7	421	\$	387	\$	145	\$	481	80.4%	37.5%		
8	203	\$	389	\$	119	\$	359	108.3%	30.6%		
9	77	\$	436	\$	171	\$	527	82.7%	39.3%		
10	46	\$	447	\$	95	\$	219	204.3%	21.3%		
11	25	\$	544	\$	112	\$	339	160.4%	20.6%		
12	17	\$	538	\$	53	\$	114	471.2%	9.9%		
13	8	\$	576	\$	66	\$	283	203.8%	11.5%		
14	3	\$	1,286	\$	178	\$	319	402.8%	13.9%		
16	2	\$	1,238	\$	71	\$	31	3961.8%	5.8%		
17	1	\$	143	\$	1	\$	17	820.4%	0.6%		

Table A.5 Frequency Table by Number of Cases

strat 1 and strat 2 combined

A.IV-3 Use of Public Services

Figure 4.3 is based on the data shown in Table A.6 below.

Univariate regression analysis of percentage payment against number of report groups at the individual level for combined strat 1 and strat 2 NCPs does not show a statistically significant relationship, but this is because division at the individual level produces large outliers. However, if we only consider NCPs with percentage payment less than 500%, then regression analysis at the individual level shows with strong statistical significance (prob F < 0.0001) that percentage payment decreases as number of report groups increases.

# Report			st	trat 1	and	stra	t 2 comb	ined	
Groups	# NCP	Avg	MOA	Avg	Pmt	Avg	Wages	MOA/Wages	Pmt/MOA
0	106,827	\$	363	\$	325	\$	1,536	23.7%	89.3%
1	20,510	\$	297	\$	218	\$	1,083	27.4%	73.6%
2	9,621	\$	255	\$	167	\$	841	30.3%	65.3%
3	5,470	\$	238	\$	151	\$	756	31.5%	63.4%
4	3,793	\$	230	\$	138	\$	700	32.8%	60.3%
5	3,725	\$	217	\$	126	\$	650	33.3%	58.0%
6	3,554	\$	211	\$	116	\$	579	36.3%	54.9%
7	3,536	\$	197	\$	103	\$	534	36.8%	52.1%
8	3,750	\$	195	\$	99	\$	503	38.7%	51.1%
9	3,660	\$	180	\$	90	\$	438	41.1%	50.2%
10	3,472	\$	173	\$	81	\$	405	42.7%	46.9%
11	3,166	\$	162	\$	72	\$	363	44.6%	44.5%
12	2,848	\$	153	\$	62	\$	320	47.9%	40.3%
13	2,367	\$	143	\$	53	\$	276	51.8%	37.2%
14	1,920	\$	144	\$	48	\$	268	53.6%	33.6%
15	1,603	\$	140	\$	47	\$	248	56.4%	33.4%
16	1,247	\$	123	\$	38	\$	222	55.3%	30.7%
17	969	\$	133	\$	39	\$	210	63.0%	29.5%
18	822	\$	114	\$	32	\$	186	61.1%	28.2%
19	586	\$	111	\$	30	\$	171	65.3%	27.3%
20	449	\$	114	\$	31	\$	168	67.7%	27.1%
21	345	\$	98	\$	19	\$	172	57.0%	19.2%
22	248	\$	93	\$	21	\$	178	52.4%	22.7%
23	213	\$	101	\$	21	\$	160	63.3%	20.3%
24	142	\$	85	\$	16	\$	136	62.8%	18.6%
25	98	\$	85	\$	19	\$	159	53.5%	22.7%
26	46	\$	91	\$	22	\$	122	74.8%	24.6%
27	32	\$	61	\$	10	\$	108	56.4%	15.9%
28	24	\$	48	\$	11	\$	150	32.1%	23.1%
29	8	\$	87	\$	19	\$	125	69.1%	22.1%
30	3	\$	26	\$	11	\$	157	16.9%	39.6%
31	1	\$	29	\$	52	\$	741	3.9%	181.0%

Table A.6 Frequency Table by Number of DSHS Other Service Report Groups

A.IV-4 High Debt

Using all the NCPs with current support due, univariate regression at the individual level for combined strat 1 and strat 2 NCPs showed a significant statistical relationship (prob F < 0.0001) between percent payment on MOA and initial arrearage debt. Restricting NCPs with only arrears due to only those who paid less than 500% of debt gave a significant statistical relationship (prob F < 0.0001) between percent payment on debt and initial arrearage debt in regression at the individual level.

In the stratification flow and risk score for Dec03 and Dec05 we use the average of arrearage debt over the 48 months, but for Dec07 we used the initial arrearage debt. We find by a regression analysis at the individual level that initial debt and average debt are strongly correlated. Using all 259,412 NCPs from Dec03 average arrearage debt is related to initial debt with p < 0.0001 and R squared of 0.86. A classification of high 4-year average arrearage debt is one of the components of risk score, but a preliminary re-classification on initial debt produced an 88.8% agreement. These findings suggest that we could use the arrearage debt in the current month, or perhaps any single month, to evaluate this risk component or to establish the basic stratification flow.

A.IV-5 Risk Score Charts

Tables A.7 to A.10 show detailed information by risk scores for NCPs in four strata.

strat 1										
score	# NCP	Avg MOA		Pmt/MOA	debt gro	Wages	MOA/Wages			
2	3,673	\$315	\$319	101.2%	-\$335	\$3,015	10.5%			
3	4,241	\$279	\$275	98.6%	-\$260	\$1,944	14.3%			
4	4,217	\$241	\$223	92.7%	\$127	\$1,396	17.2%			
5	4,312	\$268	\$221	82.4%	\$935	\$1,065	25.2%			
6	6,907	\$242	\$181	74.9%	\$1,932	\$526	46.1%			
7	5,887	\$234	\$149	63.6%	\$3,126	\$500	46.9%			
8	5,213	\$250	\$133	53.4%	\$4,577	\$486	51.4%			
9	4,510	\$235	\$124	52.5%	\$4,094	\$506	46.6%			
10	4,083	\$228	\$115	50.4%	\$3,942	\$457	49.9%			
11	3,886	\$216	\$101	46.9%	\$3,930	\$447	48.5%			
12	3,534	\$211	\$100	47.3%	\$3,729	\$435	48.5%			
13	3,412	\$198	\$91	45.8%	\$3,692	\$391	50.6%			
14	3,275	\$186	\$82	44.0%	\$3,291	\$338	55.0%			
15	3,066	\$182	\$72	39.7%	\$3,788	\$311	58.5%			
16	2,882	\$180	\$70	38.8%	\$3,241	\$263	68.6%			
17	2,587	\$176	\$60	34.0%	\$3,961	\$222	79.3%			
18	2,293	\$169	\$55	32.6%	\$3,412	\$198	85.4%			
19	1,988	\$168	\$51	30.7%	\$3,073	\$181	92.8%			
20	1,638	\$172	\$45	26.3%	\$3,503	\$163	105.3%			
21	1,491	\$170	\$42	24.5%	\$4,081	\$151	112.8%			
22	1,153	\$172	\$38	22.2%	\$4,258	\$129	133.9%			
23	960	\$164	\$43	26.0%	\$4,418	\$140	117.3%			
24	749	\$158	\$33	20.8%	\$3,747	\$136	115.6%			
25	570	\$157	\$35	22.2%	\$3,457	\$115	136.6%			
26	460	\$159	\$31	19.5%	\$3,840	\$128	124.3%			
27	325	\$153	\$28	18.1%	\$2,964	\$98	156.4%			
28	292	\$149	\$29	19.1%	\$3,764	\$105	142.3%			
29	183	\$134	\$28	21.2%	\$1,839	\$105	128.1%			
30	147	\$148	\$19	12.9%	\$3,052	\$79	186.5%			
31	113	\$146	\$17	11.6%	\$3,688	\$68	214.8%			
32	79	\$159	\$17	10.9%	\$2,963	\$64	247.8%			
33	41	\$151	\$43	28.1%	\$926	\$125	121.0%			
34	29	\$128	\$25		\$2,222	\$79	161.5%			
35	17	\$262	\$38	14.5%	\$4,029	\$111	236.2%			
36	8	\$111	\$7	6.4%	\$2,328	\$66	166.8%			
37	3	\$342	\$9	2.7%	\$11,996	\$1	37861.3%			
38	1	\$60	\$8	13.5%	\$2,605	\$15	409.6%			
39	2	\$198	\$7	3.4%	\$23,533	\$10	1962.4%			
40	1	\$153	\$2	1.3%	-	\$31	499.0%			

Table A.7 Detailed Information by Risk Score (Strat 1)

strat 2										
score	# NCP	Avg MOA	Avg Pmt	Pmt/MOA	debt gro	Wages	MOA/Wages			
1	30,687	\$373	\$379	101.6%	-\$373	\$3,694	10.1%			
2	11,984	\$424	\$423	99.5%	-\$463	\$2,237	19.0%			
3	7,413	\$358	\$349	97.4%	-\$169	\$1,479	24.2%			
4	7,207	\$387	\$336	86.8%	\$1,252	\$903	42.8%			
5	31,077	\$330	\$298	90.2%	\$856	\$101	327.8%			
6	7,484	\$325	\$230	70.8%	\$3,855	\$215	151.4%			
7	6,226	\$373	\$194	52.1%	\$7,645	\$128	292.3%			
8	2,492	\$369	\$182	49.4%	\$6,628	\$188	196.7%			
9	1,120	\$386	\$153	39.6%	\$8,243	\$182	211.7%			
10	594	\$394	\$150	38.1%	\$8,511	\$176	223.3%			
11	270	\$431	\$142	33.1%	\$11,277	\$150	287.0%			
12	142	\$493	\$126	25.6%	\$12,793	\$156	316.4%			
13	69	\$495	\$107	21.6%	\$14,010	\$133	372.5%			
14	32	\$566	\$200	35.4%	\$10,850	\$179	316.9%			
15	15	\$531	\$173	32.6%	\$20,887	\$240	221.0%			
16	3	\$479	\$140	29.3%	-\$6,421	\$8	5729.1%			
17	4	\$498	\$61	12.3%	\$29,491	\$30	1634.5%			
18	5	\$681	\$28	4.2%	\$40,590	\$83	816.9%			
19	2	\$1,021	\$185	18.1%	\$41,730	\$477	214.3%			
20	1	\$1,086	\$165	15.2%	\$46,592	\$5	21715.4%			

Table A.8 Detailed Information by Risk Score (Strat 2)

strat 3									
score	# NCP	Avg debt		Pmt/debt		Wages			
2	250	\$2,184	\$72	3.3%	-\$2,363	\$2,418			
3	696	\$2,683	\$55	2.0%	-\$1,741	\$1,160			
4	1,179	\$3,620	\$46	1.3%	-\$1,714	\$500			
5	1,064	\$6,706	\$56	0.8%	-\$2,064	\$425			
6	863	\$10,483	\$62	0.6%	-\$3,129	\$403			
7	721	\$11,179	\$61	0.5%	-\$2,568	\$467			
8	663	\$9,634	\$52	0.5%	-\$2,398	\$468			
9	623	\$8,315	\$48	0.6%	-\$2,755	\$415			
10	708	\$8,770	\$48	0.6%	-\$2,725	\$406			
11	691	\$8,526	\$48	0.6%	-\$2,665	\$334			
12	720	\$8,718	\$47	0.5%	-\$2,747	\$313			
13	679	\$8,731	\$38	0.4%	-\$2,571	\$285			
14	655	\$8,390	\$40	0.5%	-\$2,694	\$236			
15	584	\$9,836	\$29	0.3%	-\$2,861	\$202			
16	526	\$9,393	\$31	0.3%	-\$1,831	\$185			
17	425	\$10,549	\$28	0.3%	-\$3,301	\$182			
18	359	\$10,213	\$29	0.3%	-\$1,525	\$182			
19	211	\$9,879	\$29	0.3%	-\$2,576	\$128			
20	201	\$10,456	\$26	0.2%	-\$2,212	\$167			
21	155	\$10,301	\$27	0.3%	-\$2,559	\$173			
22	106	\$13,007	\$28	0.2%	-\$4,111	\$81			
23	72	\$13,925	\$19	0.1%	-\$3,651	\$97			
24	59	\$9,182	\$15	0.2%	-\$2,251	\$160			
25	44	\$6,194	\$7	0.1%	-\$1,515	\$141			
26	16	\$9,800	\$2	0.0%	-\$1,560	\$40			
27	13	\$10,157	\$3	0.0%	-\$1,114	\$118			
28	10	\$3,889	\$4	0.1%	-\$823	\$109			
29	8	\$4,403	\$18	0.4%	-\$834	\$37			
30	5	\$881	\$7	0.8%	-\$139	\$255			
31	2	\$24,865	\$7	0.0%	-\$313	\$6			
32	1	\$840	\$4	0.5%	-\$110	\$1			
33	2	\$13,737	\$1	0.0%	-\$165	\$25			

Table A.9 Detailed Information by Risk Score (Strat 3)

	strat 4										
score	# NCP	Avg debt	Avg Pmt	Pmt/debt	debt gro	Wages					
1	1,225	\$3,092	\$122	4.0%	-\$4,008	\$2,633					
2	1,472	\$4,514	\$114	2.5%	-\$4,286	\$1,251					
3	4,943	\$5,004	\$79	1.6%	-\$3,281	\$235					
4	1,755	\$13,293	\$120	0.9%	-\$5,812	\$283					
5	1,315	\$27,808	\$100	0.4%	-\$7,111	\$126					
6	322	\$29,531	\$104	0.4%	-\$7,781	\$169					
7	120	\$31,602	\$102	0.3%	-\$10,209	\$176					
8	46	\$32,242	\$96	0.3%	-\$10,106	\$236					
9	15	\$34,160	\$72	0.2%	-\$7,323	\$464					
10	8	\$33,814	\$67	0.2%	-\$4,107	\$169					
12	1	\$34,810	\$17	0.0%	-\$1,370	\$0					

A.IV-6 Time Ratio Charts

Tables A.11 to A.14 show detailed time ratio information by risk score for NCPs in four strata.

	strat 1				
		Months De	bt Change	bene/detr	
score	increase	same	decrease	timeRatio	
2	9.9	18.1	12.9	3.1	
3	11.8	13.3	14.8	2.4	
4	14.6	10.5	15.8	1.8	
5	17.2	9.0	14.9	1.4	
6	18.6	10.5	11.8	1.2	
7	21.6	8.8	11.1	0.9	
8	24.2	7.8	10.9	0.8	
9	24.3	7.7	10.7	0.8	
10	24.4	7.8	10.7	0.8	
11	24.4	8.2	10.0	0.7	
12	23.9	8.3	10.1	0.8	
13	23.9	8.3	9.7	0.8	
14	23.8	8.5	9.6	0.8	
15	24.6	8.1	9.1	0.7	
16	25.1	8.3	8.5	0.7	
17	25.8	8.2	8.2	0.6	
18	26.0	8.2	8.1	0.6	
19	27.4	7.7	7.5	0.6	
20	27.5	8.0	6.8	0.5	
21	27.8	8.2	6.7	0.5	
22	28.5	8.1	6.1	0.5	
23	27.6	8.2	6.5	0.5	
24	28.0	8.6	6.0	0.5	
25	28.3	8.5	6.2	0.5	
26	29.2	8.5	5.5	0.5	
27	29.4	8.0	5.2	0.4	
28	29.0	8.9	5.2	0.5	
29	27.9	9.9	5.8	0.6	
30	31.4	7.5	4.1	0.4	
31	28.8	10.0	5.5	0.5	
32	33.3	7.7	3.6	0.3	
33	33.4	7.0	5.0	0.4	
34	29.4	10.4	5.6	0.5	
35	34.6	6.5	6.9	0.4	
36	28.9	15.0	4.1	0.7	
37	33.3	6.3	4.3	0.3	
38	39.0	3.0	6.0	0.2	
39	45.5	0.5	2.0	0.1	
40	44.0	1.0	3.0	0.1	

 Table A.11 Time Ratio by Risk Score (Strat 1)

	strat 2				
	Average I	bene/detr			
score	increase	same	decrease	timeRatio	
1	8.6	23.2	10.4	3.9	
2	11.5	15.2	15.3	2.7	
3	14.6	10.6	17.6	1.9	
4	17.2	10.1	15.6	1.5	
5	13.1	17.9	10.4	2.1	
6	22.9	7.3	14.4	0.9	
7	27.8	5.1	12.3	0.6	
8	30.3	4.3	12.4	0.5	
9	33.7	3.1	10.4	0.4	
10	33.3	3.5	10.4	0.4	
11	36.8	2.3	8.6	0.3	
12	38.7	1.9	7.0	0.2	
13	39.3	1.9	6.2	0.2	
14	37.1	1.3	8.8	0.3	
15	38.3	1.6	8.1	0.3	
16	32.0	2.7	11.7	0.4	
17	37.5	0.5	7.0	0.2	
18	45.6	0.0	2.4	0.1	
19	47.0	0.0	1.0	0.0	
20	46.0	0.0	2.0	0.0	

 Table A.12 Time Ratio by Risk Score (Strat 2)

	strat 3				
	Average I	bene/detr			
score	increase	same	decrease	timeRatio	
2	0.6	10.5	19.7	1.8	
3	0.5	16.5	17.9	1.1	
4	0.4	21.9	14.9	0.7	
5	0.4	22.4	16.1	0.7	
6	0.3	23.5	16.9	0.7	
7	0.4	23.0	17.1	0.7	
8	0.4	23.5	14.6	0.6	
9	0.4	22.7	15.3	0.7	
10	0.4	21.7	16.9	0.8	
11	0.4	22.0	17.0	0.8	
12	0.4	20.7	17.7	0.8	
13	0.4	22.8	15.9	0.7	
14	0.4	24.6	14.0	0.6	
15	0.3	25.7	13.4	0.5	
16	0.3	25.9	12.9	0.5	
17	0.3	28.2	11.9	0.4	
18	0.4	27.3	12.6	0.5	
19	0.3	27.9	10.8	0.4	
20	0.4	28.9	9.7	0.3	
21	0.3	30.2	10.2	0.3	
22	0.4	31.0	9.2	0.3	
23	0.3	30.0	10.6	0.3	
24	0.4	30.6	7.7	0.3	
25	0.4	30.2	4.5	0.1	
26	0.4	35.9	2.2	0.1	
27	0.6	34.3	4.2	0.1	
28	0.2	31.3	6.9	0.2	
29	0.4	35.0	7.6	0.2	
30	0.6	22.0	8.2	0.4	
31	0.0	19.5	17.5	0.9	
32	0.0	44.0	4.0	0.1	
33	0.0	39.0	1.5	0.0	

 Table A.13 Time Ratio By Risk Score (Strat 3)

		strat 4		
	Average I	bene/detr		
score	increase	same	decrease	timeRatio
1	0.4	8.8	24.7	2.7
2	0.3	14.3	23.8	1.6
3	0.3	20.3	18.4	0.9
4	0.2	20.2	23.7	1.2
5	0.2	22.1	22.8	1.0
6	0.2	25.7	20.6	0.8
7	0.2	23.8	22.8	1.0
8	0.3	20.8	26.6	1.3
9	0.5	25.5	21.2	0.8
10	0.3	24.3	22.8	0.9
12	0.0	23.0	25.0	1.1

 Table A.14 Time Ratio by Risk Score (Strat 4)

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