Out-of-home placement in the Netherlands

Paths in youth care leading to out-of-home placement, and the predicting role of gender and age of the child

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Abstract

AIM: This study investigated the patterns in youth care trajectories that lead to out-of-home placement, and whether the age and gender of the child influenced the chance of out-of-home placement. METHODS: Participants were 516 children (241 girls, 275 boys) who all came in contact with youth care between 2015-2019. Of these children, half had been placed in out-of-home care. The SPADE algorithm and logistic regression were applied to the data to answer the research question. RESULTS: Results indicate that the older the child is when he/she first gets in contact with youth care, the higher the chance of out-of-home placement. There was no effect of gender on the chance of out-of-home placement. Children who were placed in out-of-home care were more often treated by specialist mental health care facilities (S-GGZ), and/or received assistance (J&O) more often than children who were not placed in out-of-home care. CONCLUSION: To conclude, the older the child is at first contact with youth care, the higher the risk of being placed in out-of-home care, and types of care such as S-GGZ and J&O can indicate a higher chance of out-of-home placement in the youth care trajectory later on.

Samenvatting

DOEL: Deze studie onderzocht de patronen in trajecten in de jeugdzorg die leiden tot uithuisplaatsing, en of de leeftijd en het geslacht van het kind de kans op plaatsing buitenshuis beïnvloeden. METHODEN: Deelnemers waren 516 kinderen (241 meisjes, 275 jongens) die tussen 2015-2019 allemaal in aanraking kwamen met jeugdzorg. Van deze kinderen was de helft uit huis geplaatst. Het SPADE-algoritme en de logistische regressie werden op de data toegepast om de onderzoeksvraag te beantwoorden. RESULTATEN: De resultaten geven aan dat hoe ouder het kind is wanneer hij / zij voor het eerst in aanraking komt met de jeugdzorg, hoe groter de kans op uithuisplaatsing. Er was geen effect van geslacht op de kans op uithuisplaatsing. Kinderen die uit huis werden geplaatst, werden vaker behandeld door gespecialiseerde GGZ-instellingen (S-GGZ) en / of krijgen vaker opvoed ondersteuning (J&O) dan kinderen die niet in uit huis werden geplaatst. CONCLUSIE: Concluderend, hoe ouder het kind is wanneer hij/zij voor het eerst in aanraking komt met jeugdzorg, hoe groter het risico om uit huis te worden geplaatst, en vormen van zorg zoals S-GGZ en J&O kunnen wijzen op een hogere kans op uithuisplaatsing later in het jeugdzorg traject.

Table of contents

Introduction

In the first half of 2019, over 37 thousand adolescents were placed in out-of-home care in the Netherlands. This is almost 11 percent of all adolescents who received youth care (Centraal Bureau voor de Statistiek, 2019a). The introduction of the Youth act[1] in 2015 in the Netherlands has so far not resulted in reducing the number of adolescents placed in out-of-home care (Centraal Bureau voor de Statistiek, 2019b). The Youth act shifted the responsibilities for youth care from the government to the municipalities (Nederlands JeugdInstituut, n.d.). The main goal of the Youth act was to simplify the youth system and make it more efficient and effective (Friele, et al., 2018). However, the first evaluation of the Youth act shows that the desired transformation has yet to take shape (Friele, et al., 2018), and the number of adolescents who are placed in out-of-home care in the Netherlands has not decreased in recent years (Nederlands JeugdInstituut, 2019).

It is important to decrease the number of out-of-home placements and improve the situation at home because removing a child from its home can be traumatic for the child (Doyle, 2007; Bartelink, Addink, Udo, van der Haar-Bolwijn, and van Yperen, 2019). Furthermore, out-of-home placement is often associated with placement instability (Smith, Stormshak, Chamberlain, and Whaley, 2001), and placement disruption is linked to attachment problems, and emotional and behavioral problems in children (Smith, et al., 2001; Newton, Litrownik, and Landsverk, 2000).

Instead of out-of-home placement, forms of intensive, non-residential care are considered to be more desirable. Youth care should be as short, light, and close to home as possible (Janssens, and Kemper, 2003; Nederlands JeugdInstituut, 2019). However, the lack of reduction in the number of out-of-home placements shows that youth care institutions and

[1] https://www.eerstekamer.nl/9370000/1/j9vvkfvj6b325az/vjpmdhjwhaym/f=y.pdf;

municipalities are not yet capable of helping more children within their own family or in other family-like situations (Nederlands JeugdInstituut, 2019).

This paper is commissioned by Transformatie Jeugd Utrecht West. By means of two programs with associated projects, Transformatie Jeugd Utrecht West focuses on 'a better home together'. Their goals are; to reduce the number of out-of-home placements, and to reduce the number of youth care programs per child (Transformatie Jeugd Utrecht West, 2020). Transformatie Jeugd Utrecht West is interested in whether there are existing combinations of subsequent inclusions in different youth care programs which precede out-of-home placement in the Netherlands.

Knowing the patterns in youth care trajectories that lead to out-of-home placement will provide the possibility to identify children who are at higher risk of out-of-home placement. This will enable on time intervention; resulting in higher chances of preventing out-of-home placement.

Factors influencing out-of-home placement

The chance of out-of-home placement can be influenced by characteristics of the adolescent, such as emotional, behavioral, and medical problems (Bhatti-Sinclair, and Sutcliffe, 2012). The more severe someone's problem behavior is, such as impulsive and deviant behavior, the higher the chance of out-of-home placement (Scholte, and van der Ploeg, 2000; Leloux-Opmeer, Kuiper, and Scholte, 2015). Boys have a higher risk of developing problem behavior compared to girls. Especially externalising problems are more likely to be exhibited by boys (Stevens, 2014). In addition, parents report problem behavior more often with sons than with daughters (Bot, de Roos, Sadiraj, van den Broek, and Kleijnen, 2013). Overall, boys receive youth care more often than girls, both youth care with, and without out-of-home

placement (Centraal Bureau voor de Statistiek, 2019b). With regards to age, the older the adolescent is, the more problems he/she is likely to have (Bot, et al, 2013). This is in line with Moffitt's (1993) maturity gap theory. According to this theory, adolescents experience a maturity gap during puberty which increases their risk of problem behavior, because adolescents start to mimic deviant peers in order to gain adult status and power (Moffitt, 1993). In line with this theory, parents with older children use the help of psychologists, pedagogues, and youth care agencies more frequently than parents with younger children (Zeijl, Crone, Wiefferink, Keuzenkamp, and Reijneveld, 2005). Having delinquent peers can also coincide with problem behavior. According to Bandura's Social learning theory (1985), adolescents often copy other people's behavior, especially during puberty. Being friends with children who show problem behavior themselves, can push the adolescent into copying this problem behavior him- or herself (Bot, et al., 2013).

Adolescents may be placed in out-of-home care because their parents are unable to take care of them. First economic factors may play a role. Poverty, for instance, increases the risk of out-of-home placement (Barth, Wildfire, and Green, 2006). Personal factors can play a role as well. Parents who are suffering from addiction, have psychological problems, have demonstrated criminal behavior themselves, teen moms, and parents in single-parent households, have a higher risk of having their children placed in out-of-home care (Philips, Burns, Wagner, and Barth, 2004; Bot, et al., 2013). According to the Problem behavior theory, all behavior is a result of person-environment interaction, and therefore, both internal and external factors can influence problem behavior (Donovan, Jessor, and Costa, 1988). This means that the negative behavior of a parent can also influence the problem behavior of his/her child, since this influences the environment of the child.

The present study

To my knowledge, no previous studies have been conducted in the Netherlands which examine the consecutive inclusion in youth care programs that often precede out-of-home placements, while taking into account the possible influences of the gender and age of the child on the chance of out-of-home placement. Therefore this research is one of the first systematic studies of the patterns in the consecutive youth care programs preceding out-of-home placements in the Netherlands, and how the chance of out-of-home placement is influenced by the age and gender of the child. This is investigated by answering the following questions:

1. Which prior combinations of subsequent inclusions in different youth care programs precede out-of-home placements in the Netherlands?
2. To what degree can age and gender of the child be seen as predictors of out-of-home placement?

Although we know that all the aforementioned factors, such as the peer influence, the emotional, behavioral, and medical problems, can influence the trajectories of youth care a youth receives, only the age and gender of the child will be taken into account in this research. This is due to the fact that the dataset only includes these personal factors of the child, and because of privacy and legal concerns, no other variables could be added.

No hypothesis can be derived for the patterns in the trajectories due to limited previous research on the consecutive inclusion in youth care programs that often precede out-of-home placement. For the gender and age at first contact with youth care it was hypothesized that:

Hypothesis 1: Boys have a higher risk of being placed in out-of-home care

Hypothesis 2: The older the child is when he/she first gets in contact with youth care, the higher the chance of out-of-home placement.

These hypotheses lead to the following research model;

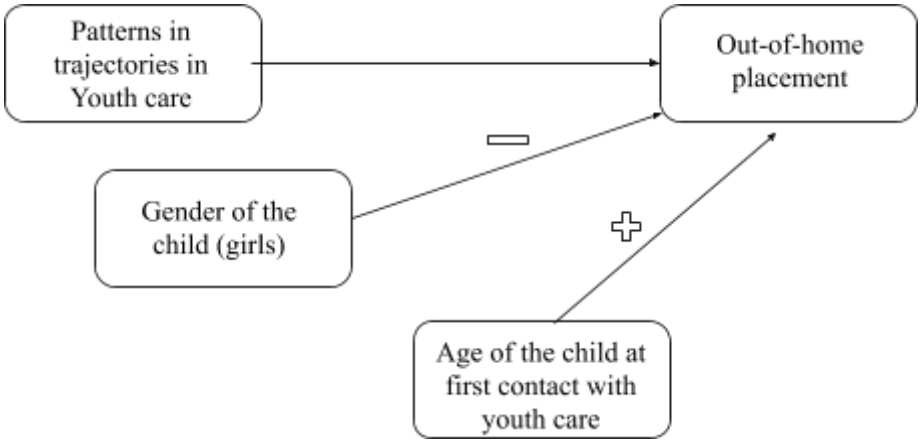

Figure 1. **Research model**

Methods

2.1 The sample

This research used the 'SUITE' dataset from the municipality of Stichtse Vecht. The dataset consisted of information about the youth care trajectories of youths from Stichtse Vecht who received four or more individual types of youth care between 2015-2019. The data were collected by using official data from the municipality of Stichtse Vecht.

From the dataset, all youths who were placed in out-of-home care were included in the target group. This group had an N of 258. A control group was formed by randomly assigning 258 youths who did come in contact with youth care, but were not placed in out-of-home care. In total, this research had an N of 516 youths.

The target group consisted of 138 boys and 120 girls. In this group the age at the time of the first contact with youth care ranged from -1 to 20. The age of -1 meant that the child was not born yet when the first youth care program was implemented. Overall, the children in this group were relatively old when they first got into contact with youth care (*M*=11.39, *SD*=4.653), with the mode being 15 years.

The control group consisted of 137 boys and 121 girls. The ages at first contact with youth care of the children in this group, ranged from 0 to 19. In contrast with the target group, the children in the control group were on average younger when they first got into contact with youth care (*M*=9.95, *SD*=4.131), with the mode being 7 years.

2.2 Design

This study had a retrospective longitudinal design because the data incorporated past trajectories which were spanning multiple years.

2.3 Procedure

This research has been approved by the Ethical Review Committee of the University of Utrecht, faculty of Social Sciences, and was also approved during a meeting at Stichtse Vecht on March 3rd, 2020.

The data was provided by the municipality of Stichtse Vecht after deleting identifiers of the children. The BSN numbers were deleted to meet the requirements of the AVG (Autoriteit Persoonsgegevens, 2020). To identify the children a new unique number was made. This number was constructed by combining a part of the line number with a part of the unique client ID number from the SUITE dataset.

2.4 Measuring instruments

Most names of the youth care programs have changed over the years, which meant that categories had to be made of the programs in order to conduct this research. The categorizing of the data resulted in 15 categories (Attachments 6.1).

Of these categories, 5 were types of out-of-home placement; Foster care, Staying over (Logeren), Family homes (Gezinshuis), Essential function, and Crisis stay. Essential functions is the most invasive type of out-of-home placement, since this is often a type of closed out-of-home placement. Crisis stay is used when situation is (life)threatening for the child or for one or more family members (Bartelink, van Vianen, Mourits, ten Berge, and Meuwissen, 2015).

The categories 'Basis GGZ' (B-GGZ), 'Specialistische GGZ' (S-GGZ) and 'Jeugd en Opvoedhulp' (J&O) were the largest categories which were not a type of out-of-home placement. Children can be referred to basic mental health care (B-GGZ) for mild to moderate psychological problems. More severe cases of psychological problems are referred to specialist mental healthcare (S-GGZ) (Rijksoverheid, 2020). The category 'J&O' consists of ambulatory forms of care and daytime activities or short treatments. The other categories which were not related to out-of-home placement were; Custody (Voogdij), Transport (Vervoer), Supervision (Ondertoezichtstelling), Pediatrics (Kindergeneeskunde), and 'In verbinding thuis en groep'.

In this research the out-of-home placement of the child was the dependent variable. The out-of-home placement of the child was not per se the final type of care a youth has received. The independent variables in this research were all the categories of youth care a youth has had (except the categories of out-of-home placement). The types of care were not mutually exclusive.

The age and gender of the child were included as extra predictors for out-of-home placement. The age of the child was used as the age of the child when it entered the youth care system. The original dataset measured age from -1 to 20, where -1 meant that the child was not born yet when it first got registered into foster care. This variable was recoded so that two years were added to each age. This meant that -1 became 1, 0 became 2, et cetera. This variable was called 'Age at first contact with youth care'.

A dummy variable called 'Gender' was used to measure the gender of the child. In this dummy, 0 referred to 'male', and 1 refers to 'female'.

For the logistic regression analysis, a dummy variable was added to show whether a child was placed in out-of-home care (1) or not (0), this variable was called 'Out-of-home placement'.

2.5 Data analysis

The statistical computing language R was used to apply data mining algorithm SPADE and to conduct the regression analysis. The data were first transformed to fit the SPADE algorithm and the regression analysis.

The SPADE algorithm is an algorithm which mines sequential patterns from a transaction matrix (Zaki, 2001; Koenecke, 2019). Zaki, the creator of this algorithm explains the algorithm as follows: "Let's say that the database records the books bought by each customer over a period of time. The discovered patterns are the sequences of books most frequently bought by the customers. An example could be that, 70% of the people who buy Jane Austen's *Pride and Prejudice* also buy *Emma*" (Zaki, 2001). The sequences are then shown as <{Pride and Prejudice}, {Emma}>, indicating that *Pride and Prejudice* preceded *Emma.*

The SPADE algorithm was used in this research to discover frequent sequences in the youth care trajectories which precede out-of-home placement. While the categories could appear before the out-of-home placement, and after the out-of-home placement, only those sequences were analysed which had out-of-home placement as the last type of care.

The algorithm was run several times; for each of the different types of out-of-home placement, for the total target group, and for the control group. To make this possible, new datasets were created; one for each type of out-of-home placement, one for the target group, and one for the control group, and then read into R. For instance; the dataset for Foster care only included the children who were placed into foster care.

To find the frequent sequences the SPADE algorithm needs the support value to be determined. Support measures how frequent an itemset is in all the transactions (Koenecke, 2019). Since not every type of out-of-home placement was that common in the dataset, different support values were applied for the analysis. Foster care had the lowest support value (0.2) because the group of children who experienced Foster care was the largest. Family homes and Staying over had the highest support value (0.6) because these groups were the smallest. A support of 0.6 meant that only those frequent sequences were generated which were present in 60 percent of the children of the specific group of out-of-home placement.

Since it was not possible to include the variables ‘Gender’ and ‘Age at first contact with youth care’ to the SPADE algorithm, and the SPADE algorithm did not show which children belonged to the frequent sequences it found, a logistic regression analysis was added to this research. The logistic regression was used to check whether ‘the Age at first contact with youth care’ and ‘Gender of the child’ could influence the chance of out-of-home

placement of a child. The logistic regression analysis included both the target group and the control group.

Before the logistic regression analysis was carried out, the assumption of multicollinearity was tested. The VIF values were around 1.0006, indicating that the condition of multicollinearity were not violated (Hair, Ringle, and Sarstedt, 2015; Allison, 2012). Thereafter the data was checked for outliers, none were found.

Results

3.1 Descriptive statistics of the types of care

Table 3.1 shows how often the types of care appeared in the target group and the control group.

Table 3.1 ***Descriptive statistics of the target group and control group***

Type of care	Target group	Control group
B-GGZ	52	129
J&O	642	157
S-GGZ	433	300
Consultation	6	1
In verbinding thuis en groep	5	-
Transport	54	7
Custody	30	-
Pediatrics	26	57
Supervision	50	-
N (Total number of children)	258	258

During the first initial analyses of the categories in the target and control group, including independent sample T-tests, it became clear that the category B-GGZ was significantly more common in the control group, compared to the target group ($t(477)=5.002$, $p=<.001$). Table 3.1 shows that B-GGZ appeared 129 times in the control group, whereas in the target group, it appeared only 52 times. The category J&O was significantly more common in the target group (642 times), compared to the control group (157 times) ($t(321)=-8.013$, $p=<.001$). S-GGZ was more equally distributed, but still significantly more common in the target group (433 times) than in the control group (300 times) ($t(425)=-3.117$, $p=0.196$).

The T-tests were only conducted on categories which occurred more than 30 times in both the target and control group. The other categories; Consultation, 'In verbinding thuis en groep', Transport, Custody, and Supervision, all appeared in the target group but did not appear, or appeared only a few times in the control group. Only Pediatrics appeared more often in the control group than the target group.

3.2 SPADE algorithm

Given the limited word count, only the most remarkable and important frequent sequences will be discussed.

3.2.1 SPADE algorithm per type of out-of-home placement

In Table 3.2 each column presents the results of applying the SPADE algorithm per type of out-of-home placement. When adding op all the N's of the types of out-of-home placement, it becomes clear that some children have received multiple types of placement, since the total N (316) is higher than the N of the target group (258).

Table 3.2 ***All relevant results of the SPADE algorithm per type of out-of-home placement***

X	Foster care	Essential functions	Crisis stay	Staying over	Family homes
	Support	Support	Support	Support	Support
{X}	0.464	0.463	-	0.638	0.600
{X}, {X}	0.286	-	-	-	-
{J&O}	0.329	0.538	0.487	0.851	0.800
{J&O}, {J&O}	0.329	-		-	-
{S-GGZ}	0.307	0.425	0.564	0.660	0.700
{S-GGZ}, {S-GGZ}	-	-	-	-	0.600
Minimum support	0.2	0.4	0.4	0.6	0.6
N	140	80	39	47	10

The X's in the table refer per column to the type of out-of-home placement, e.g. in the column of Foster care {X}, {X} refers to {Foster care}, {Foster care}.
A '-' indicates that that particular sequence was not found for that type of out-of-home placement.

As indicated by lower Minimum Support values, the column of Foster care shows the most elaborate analysis. Foster care was administered most, and therefore the trajectories leading to this type of out-of-home placement can be studied in detail. Descending to columns to the right, the results are less detailed due to the lower N but I will nonetheless discuss them.

3.2.1.1 Frequent sequences for Foster care

Table 3.2 demonstrates that 46.4 percent of the children were placed in Foster care at least two times, and 28.6 percent of the children received Foster care at least three times. The results furthermore show that 30.7 percent of the children first received S-GGZ before they received Foster care. With regards to J&O, 32.9 percent of the children first received J&O and then received Foster care. Since the sequences <{J&O}, {Pleegzorg}> and <{J&O}, {J&O}, {Pleegzorg}> both have a support value of 0.329, we can safely assume that all the children who first received J&O before they received Foster care, did so twice.

3.2.1.2 Frequent sequences for Essential functions

Essential functions is the most invasive type of out-of-home placement and therefore it is important to know that almost half of the children (46.3 percent) already received this type of care once before they were placed in Essential functions again.

J&O preceded Essential functions in 56.3 percent of the children, and S-GGZ preceded Essential functions in 42.5 percent of the cases.

3.2.1.3 Frequent sequences for Crisis stay

In the group of children who had received Crisis stay as a type of out-of-home placement, J&O preceded Crisis stay in 48.7 percent of the cases. S-GGZ preceded Crisis stay in 56.4 percent of the children. No sequences were found (with a support greater than or equal to 0.4) where Crisis stay was preceded by an earlier form of Crisis stay.

3.2.1.4 Frequent sequences for Staying over

Staying over is often administered more than once, since 63.8 percent of the children received this type of care at least two times. According to the results, in 85.1 percent of the cases J&O preceded Staying over. S-GGZ also preceded Staying over, but less frequently than J&O. The sequence <{S-GGZ}, {Logeren}> occurred in 66 percent of the cases.

3.2.1.5 Frequent sequences for Family homes

J&O preceded the placement into a Family home in 80 percent of the cases. In 70 percent of the cases, Family home was preceded by S-GGZ, and in 60 percent of the cases children had already experienced S-GGZ twice before they were placed in a Family home. The placement

into Family homes is often repeated as well. The sequence <{Gezinshuis}, {Gezinshuis}> is present in 60 percent of the children, meaning that they were placed in a Family home at least two times.

3.2.2 Comparison of the Frequent sequences between the target group and control group

In Table 3.3 below, only those sequences will be discussed which were both found in the target group and in the control group. It was not possible to test whether the findings differed significantly between the two groups as SPADE did not offer this functionality.

Table 3.3 ***Frequent sequences of the Target and Control group***

X	Target group	Control group
Sequence	Support	Support
<{B-GGZ}>	0.143	0.376
<{J&O}>	0.612	0.283
<{S-GGZ}>	0.539	0.527
<{J&O}, {J&O}>	0.442	-
<{B-GGZ}, {S-GGZ}>	0.101	0.101
<{S-GGZ}, {S-GGZ}>	0.376	0.248
<{S-GGZ}, {S-GGZ}, {S-GGZ}>	0.252	0.120
Minimum support	0.1	0.1
N	258	258

B-GGZ appeared in 14.3 percent of the trajectories of the children in the target group, and appeared in 37.6 percent of the trajectories of the children in the control group. While B-GGZ appears more often in the trajectories of children in the Control group, B-GGZ preceded

S-GGZ equally as often in the Target group as in the Control group (10.1 percent of trajectories).

Furthermore, 53.9 percent of the trajectories of the children in the target group included S-GGZ at least once. In the control group, 52.7 percent of the trajectories of the children included S-GGZ at least once. The sequences <{S-GGZ}, {S-GGZ}> and <{S-GGZ}, {S-GGZ}, {S-GGZ}> were more common in the target group. This indicates that children in the target group more often experience S-GGZ more than once, compared to the children in the control group.

The category J&O appeared in the target group at least once in 61.2 percent of the trajectories, while it only appeared at least once in 28.3 percent of the trajectories in the control group. Furthermore, no sequences were found for the control group where J&O appeared more than once, indicating that this only applies for the target group. In the target group J&O appeared at least twice in 44.2 percent of the trajectories.

3.3 Logistic regression

In order to test whether gender and age at first contact with youth care affect the chance of out-of-home placement, a logistic regression analysis was conducted.

Table 3.4 demonstrates that there is no significant effect of gender on the log odds of out-of-home placement. The results do however show that the log of the odds of a child being placed in out-of-home care was positively related to age at first contact with youth care (b = .080, z = 3.504, p <.001). The odds ratio (OR) shows that for a one-unit increase of 'Age at first contact with youth care', the odds of being placed in out-of-home care increases with a factor of 1.083 (*OR*= 1.083, *95% CI*= 1.037-1.134). This indicates that the odds of being

placed in out-of-home care are 8.37 higher when the age of a child increases with one year ((1.0837 -1)*100 = 8.37%).

Table 3.4 ***Logistic regression with as dependent variable the dummy variable out-of-home placement.***

	Model 1			
	b	Se	OR	95% CL
Constant	-1.056***	.317	.348	0.185-0.644
Gender	- .098	.201	1.103	0.744-1.637
Age at first contact with youth care	.080***	.023	1.083	1.037-1.134
Pseudo R^2		.022		
N	516			

The dependent value measures out-of-home placement where: 1 = placed in out-of-home care, 0 = never placed in out-of-home care
Gender: 1 = female, 0 = male
***p<.001, **p<.01, *p<.05

A likelihood ratio test showed that the logistic regression in Model 1 provided a better fit to the data than the null model. However, the Hosmer-Lemeshow test resulted in a p value smaller than .05, and the explained variance indicated by the pseudo R2 was only 2 percent, which indicates that the results should be interpreted with care (Hosmer, and Lemeshow, 2000).

Conclusion and Discussion

This research tried to answer the question: 'Which patterns in the consecutive youth care programs precede out-of-home placement in the Netherlands, and is the chance of out-of-home placement influenced by the age and gender of the child?' Previous research into this relationship are scarce, making this one of the first systematic investigations.

This research found that; the out-of-home placement of a child is often preceded by S-GGZ, and children who were placed in out-of-home care received S-GGZ significantly more often compared to children in the control group. This can be explained by the fact that S-GGZ is offered as treatment to children who suffer from more severe cases of psychological problems such as emotional and behavioral problems (Rijksoverheid, 2020), and that children who suffer from emotional and behavioral problems are more often placed in out-of-home care (Bhatti-Sinclair, and Sutcliffe, 2012).

While a single occurrence of S-GGZ preceded all types of out-of-home placement, only some children who were placed into Family homes had first received S-GGZ multiple times. There are two types of family homes; general family homes and specialistic family homes. Specialistic family homes focus on a specific psychological disorder[2]. A child may therefore first receive S-GGZ treatments, and when the S-GGZ treatments are deemed unsuccessful, a child can be placed in a specialistic Family home for further treatment[2]. However, due to the categorization of the data, general family homes and specialistic family homes were placed into the same category. Therefore we do not know whether the children who received S-GGZ at least two times before they were placed into a Family home, were actually placed into a specialistic family home.

The out-of-home placement was often preceded by J&O as well, and children who were placed in out-of-home care received J&O significantly more often compared to children in the control group. J&O is most often administered to children in lower educated families[2], and lower educated parents report more problem behavior in their child(ren) (Bot, et al., 2013). Since problem behavior increases the chance of out-of-home placement (Scholte, and

[2] This information originates from an interview with Edith Warmerdam (Program manager at Transformatie Jeugd Utrecht West)

van der Ploeg, 2000; Leloux-Opmeer, Kuiper, and Scholte, 2015), this can explain why J&O is more frequent in children who are placed in out-of-home care.

While a single occurrence of J&O preceded all types of out-of-home placement, only some children who were placed into Foster care had first received J&O multiple times. This can be explained by the effort of youth care institutes to place the child in the care of someone in their network, rather than directly placing the child in Foster care. The exploration whether the child can be placed with someone within their network can take some time, which might explain why multiple J&O treatments precede the ultimate Foster care placement of a child[3].

This research had two additional important findings; 1) the first hypothesis that the gender of the child had a direct influence on the chance of out-of-home placement could not be confirmed in this study. This is in contrast with findings from the Centraal Bureau voor de Statistiek (CBS) which indicated that boys were being placed in out-of-home care more often than girls (Centraal Bureau voor de Statistiek, 2019b). Since the results of the CBS study are based on national data, and this study only used the data from Stichtse Vecht, this might contribute to the difference in results. 2) The second hypothesis that there would be a direct effect of the age of the child at first contact with youth care, was confirmed by this study. This means that the older the adolescent is when he or she gets in contact with youth care for the first time, the higher the chances are that he or she will eventually be placed in out-of-home care. This finding is in line with Moffitts' (1993) Maturity gap theory, but may also be the result of the attempt of municipalities to limit the out-of-home placements of children younger than 12 years[3].

[3] This information originates from an interview with Edith Warmerdam (Program manager at Transformatie Jeugd Utrecht West)

Lastly, Foster care seemed to be the only type of out-of-home placement which was ever administered (at least) three times. An explanation for this finding is that Foster care is prone to breakdowns when the match between the child and the foster parents is not optimal[4].

A strength of this research is that it is one of the first studies in this field which focuses on the patterns in the consecutive youth care programs which precede out-of-home placement in the Netherlands, and the influence of age and gender on the chance of out-of-home placement. Another strength is the big sample size (516) of this research. Lastly, to my knowledge this research was the first to use the SPADE algorithm to mine the sequences in the youth care trajectories.

This research was not free of limitations. In an ideal situation the data set would not have to be categorized, because without categorizing more specific sequences can be found. Another limitation was the fact that some types of out-of-home placement were not common, lowering the reliability of the findings for these smaller groups. Three shortcomings of the SPADE algorithm were; 1) the fact that it did not measure the confidence of the sequential patterns (Zaki, Lesh, and ogihara, 1998), making it impossible to make predictions for the future; 2), the SPADE algorithm did not allow me to control for other variables other than sequential variables, it was therefore not possible to check how the 'Age of the child at first contact with youth care' and the 'Gender of the child' could have differed per frequent sequence; 3) it was not possible to see which sequences belonged to which children, limiting further analyses. The last limitation was that the dataset did not offer more variables such as educational level and ethnicity, limiting the analyses.

Future research should try to eliminate the necessity of categorizing, which would benefit the research since this could lead to more and clearer frequent sequences. An even

[4] This information originates from an interview with Edith Warmerdam (Program manager at Transformatie Jeugd Utrecht West)

bigger dataset would allow a lower support value for the SPADE algorithm which could lead to more sequences. It would lastly be interesting to add more variables, check whether different results can be found in different municipalities, and to use other sequence mining algorithms.

This research attempted to contribute to the growing literature on youth care and out-of-home placements. The findings of this research show that a high age at first contact with youth care, and types of care such as J&O and S-GGZ, can be indicators of a higher chance of out-of-home placement. The results of this study can be used to better understand which children are at higher risk of out-of-home placement. This information may lead to more clarity for the youth care workers, which can ultimately lead to earlier interventions or more attention being paid to the child, which can decrease the amount of out-of-home placements.

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Attachments

6.1 Categories of youth care trajectories

The categories below have been drawn up in cooperation with A. Maanders. Since the data set consisted of trajectories that were given in the period between 2015-2019 some product names have changed and some products content have changed. The trajectories that currently exist were categorised by the 'regionale inkoopsamenwerking - Inkoop Utrecht-West'. The 'old' trajectories, trajectories that are no longer provided now, were categorized with the help of conversion tables which were made by 'Inkoop Utrecht-West'. These conversion tables are used to make the conversion administrative. Some old trajectories were equal to several new trajectories which fell into different smaller categories. This meant that some smaller categories had to be merged into one bigger category (e.g. 'Jeugd en Opvoedhulp', 'Specialistische GGZ'). The names of the categories were made in Dutch because the dataset was in Dutch and because Stichtse Vecht may want to use these categories in the future.

Category 1: Jeugd en opvoedhulp (J&O)

- PGB 32 ambulante jeugdhulp
- ZV: ambulante jeugdhulp op locatie van de aanbieder
- PGB 32 Zorg aan jeugd (zonder verblijf) individueel → is dit wel ambulant, of behandeling of dagbesteding?
- PGB 33 zorg aan jeugd (zonder verblijf) in groep → dezelfde vraag als hierboven
- Zonder verblijf: daghulp op locatie van de aanbieder
- Zonder verblijf uitgevoerd door wijk of buurtteam
- PGB jeugdhulp ambulant
- PGB 34 J&O ambulant
- J&O ambulant
- (H153) Gespecialiseerde begeleiding (psy) (p/u)
- Opvoedondersteuning doven en slechthorenden
- Behandeling (licht) → (te weinig van licht dus samenvoegen met middel?)
- Behandeling kort - vanaf 200 tot en met 399 min
- Behandeling (middel)
- Behandeling (zwaar, incl spoedeisende hulp)
- Ambulante behandeling
- PGB 33 J&O dagbehandeling
- (H816) Dagactiviteit VG kind zwaar
- (H997) Dagactiviteiten GGZ-LZA
- (Z533) Per dag ZZP 3LVG incl BH incl DB
- (H331) Behandeling families first (j)lvg (p/u)
- (H300) Begeleiding
- Begeleiding (licht)
- Begeleiding (middel / zwaar, incl spoedeisende hulp)

- Begeleiding (midden)
- Begeleiden op eigen locatie aanbieder: outputgericht
- Begeleiding (zwaar, incl spoedeisende hulp)
- Jeugdhulp ambulant specialistisch: outputgericht
- Specialistische begeleiding jeugdhulp ambulant
- J&O crisis ambulant
- Jeugdhulp crisis ambulant: outputgericht
- PGB dagbesteding
- Dagbesteding : outputgericht
- Daghulp
- Dagactiviteit
- Dagactiviteit (middel)
- Dagactiviteit (zwaar)
- Dagactiviteit (extra zwaar)
- Dagactiviteit JLVG
- Dagactiviteiten GGZ-LZA
- 31 jeugdzorg NIET ingekocht door utrecht west
- Onderwijs zorgarrangement
- Zonder verblijf: jeugdhulp in het netwerk van de jongere
- dagbehandeling specialistisch: outputgericht
- (H153) behandeling basis jlvg (p/u)
- (H325) behandeling basis jlvg (p/u)

Category 2: Persoonlijke verzorging

- Persoonlijke verzorging
- PGB 34 persoonlijke verzorging
- H126 persoonlijke verzorging

Category 3: In verbinding thuis en groep

- In verbinding thuis en groep

Category 4: Kindergeneeskunde

- Behandeling of onderzoek op de polikliniek of dagbehandeling bij gedragsproblemen
- Consult op de polikliniek by gedragsproblemen
- Aspecifiek
- Algemene code 2016
- Algemene toewijzingscode

Category 5: vervoer

- PGB 33 vervoer
- PGB vervoer
- Vervoer : outputgericht

Category 6: Consultatie

- Consultatie (opleiding HBO en HBO+)
- Consultatie (opleiding WO en WO+)
- Advies en indicatie kosten JW

Category 7: Specialistische GGZ (S-GGZ)

- Zeer intensieve kortdurende observatie en stabilisatie (ZIKOS)
- Jeugd ggz crisis behandeling
- LTA zorg jeugd nog nader te bepalen
- Nog nader in te vullen
- LTA zorg jeugd nog nader te bepalen
- Algemene code Aspecifiek
- verblijf (incl begeleiding)
- Verblijf zonder overnachting (VZO), per dag
- Jeugd-ggz beschikbaarheidscomponent voor 24-uurs crisiszorg
- Jeugd ggz verblijf zonder overnachting
- Specialistische GGZ (opt-out)
- Opt-out regeling Specialistische GGZ
- Jeugd ggz verblijf tariefklasse A/B/C/D/E/F/G
- Per dag ZZP VG&LG verblijfscomponent
- (Z992) Per dag ZZP GGZ verblijfscomponent
- Deelprestatie verblijf A
- Deelprestatie verblijf B
- Deelprestatie verblijf C
- Deelprestatie verblijf D
- Deelprestatie verblijf E
- Deelprestatie verblijf F
- Deelprestatie verblijf G
- Deelprestatie vb B (Beperkte verzorgingsgraad) (incl. NHC component)
- PGB Specialistische GGZ
- Jeugd ggz behandeling specialistisch
- Algemene toekenningscode S-GGZ
- Diagnostiek
    - Jeugd ggz diagnostiek
    - Restgroep diagnoses - vanaf blablabla
- Pervasief
    - … - vanaf 250 tot en met 799 min
    - … - va 18000 t/m 23999 min
    - … - vanaf 3.000 tot en met 5.999 min.
    - (224) … - va 18000 t/m 23999 minuten
    - … - vanaf 800 tot en met 1.799 min
- Somatomorfe
- Aandacht- en gedrag
    - … va 1800 t/m 2999
    - … va 250 t/m 799 min
- Aandachtstekort- en gedrag-
    - … vanaf …
- Depressie
    - (235) … va - ….
- Angst
    - (238) … -va …
- Schizofrenie
    - …. - vanaf

- Diagnostiek
    - … van 400 t/m 799 minuten
- Overige kindertijd
- EED → enkelvoudige ernstige dyslexie
    - Overige kindertijd EED - vanaf …
    - Behandeling EED
    - Algemene toekeningscode EED
- Crisis
    - (15) … - va …
- Persoonlijkheid
    - … - van …
- Overige aan een middel - 600 t/m 11999

Category 8: Basis GGZ (B-GGZ)

- PGB …
- (180001) basis GGZ kort
- (180002) Basis GGZ Middel (BM)
- (180003) Basis GGZ intensief (BI)
- Kort
- Middel
- Intensief
- Chronisch
- Onvolledig behandeltraject
- Algemene toekenningscode B-GGZ

Category 9: OTS (onder toezichtstelling → ouders nog gezag)

- OTS overig
- (V) OTS
- Ondertoezichtstelling 1e jaars
- Ondertoezichtstelling jaar 1: outputgericht

Category 10: voogdij (pas ingezet bij uithuisplaatsing)

- Voogdij: outputgericht
- Voogdij

Category 11: crisis verblijf

- Jeugd ggz crisis verblijf
- Jeugdhulp crisis verblijf (incl behandeling): outputgericht
- J&O crisis residentieel
- Crisis residentieel
- Jeugdhulp crisis pleegzorg: outputgericht
- Crisis pleegzorg
- (Z560) Per dag ZZP crisisopvang LVG (jeugd)

Category 12: logeren

- Logeren : outputgericht
- Logeren : inspanningsgericht
- Kortdurend verblijf
- PGB 38 kortdurend verblijf
- PGB jeugdhulp verblijf

Category 13: Pleegzorg

- Pleegzorg : outputgericht
- J&O pleegzorg deeltijd
- J&O pleegzorg voltijd
- J&O pleegzorg
- Met verblijf: pleegzorg
- Pleegzorg bijzondere kosten (vrijwillig kader)
- Pleegzorg (justitieel kader) - bijzondere kosten
- Team gespecialiseerde verpleging incl pleegzorg
- Jeugdhulp verblijf: outputgericht
- Deeltijd verblijf :outputgericht (verblijf:outputgericht)

Category 14: Essentiële functies (vergelijkbaar qua zwaarte)

- Gesloten plaatsing : opname BOPZ: outputgericht
- Gesloten plaatsing : traject jeugdzorgplus : outputgericht
- Behandelen verblijf anders driemilieuvoorziening: outputgericht
- Verblijf: inspanningsgericht (licht)
- Verblijf : inspanningsgericht (zwaar)
- Verblijf : inspanningsgericht (midden)
- Met verblijf: overig residentieel
- Behandelen verblijf driemilieuvoorziening (inclusief zzp 4 en 5)
- Jeugdhulp verblijf (overig residentieel)
- JSLVG (obv LVG 4)
- J&O jeugdzorg plus
- Jeugdhulp verblijf: inspanningsgericht (licht/midden/zwaar)
- Jeugdzorgplus voor onder 12 jaar
- Residentieel
- PGB 38 J&O residentieel
- J&O residentieel

Category 15: gezinshuis

- Gezinshuis plus
- Gezinshuis
- Met verblijf: gezinsgericht

Figure A.1

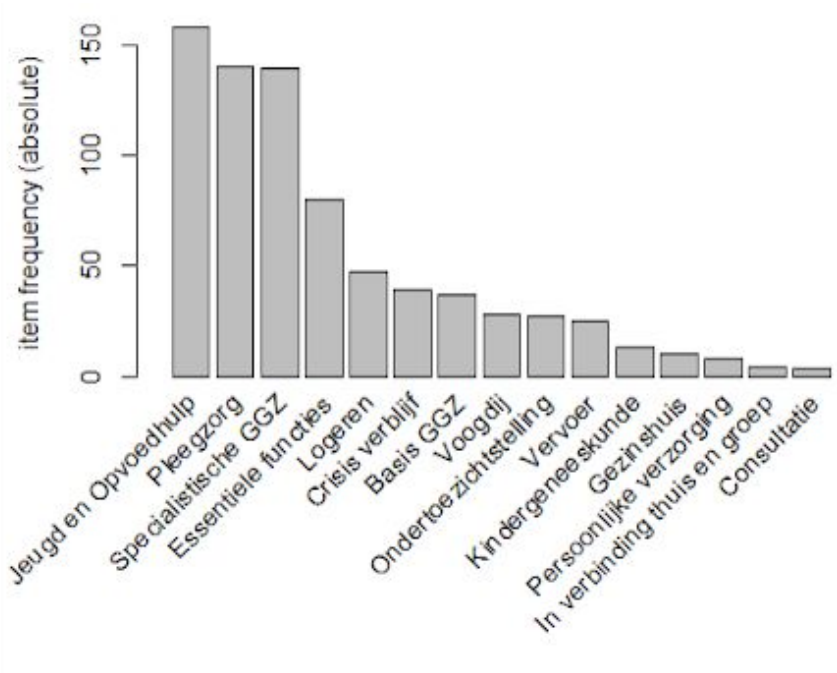


Figure A.1. Item frequency plot of the distribution of the categories

6.2 R codes

Explanation before reading the syntax:
The codes are written in *italic* and the description of what the code does is underlined.
The subtitles which indicate what is going on are written in **bold**.

Different codes are separated with a blank line, meaning that the code below is one code.

```
HorizonDes%>%
  count(Geslacht)
```

The Syntax:
Loading the packages

```
library(dplyr)

library(ggplot2)

library(tidyverse)

library(arules)

library(tidyr)

library(tinytex)

library(readxl)

library(xlsx)

library(arulesViz)

library(arulesSequences)

library(klaR)

library(factoextra)

library(ggfortify)
```

Create Target and Control group as data frame.

```
Doel <- read_excel('Doel_groep.xlsx')

View(Doel[1:10, ])

Controle <- read_excel('Controle_groep.xlsx')

View(Controle[1:10, ])
```

Analysis for the descriptives for the Target group

First: only select the columns you need

```
DoelDes <- dplyr::select(Doel, UniekID, Geslacht, Leeftijd_begin, Traject, Rank)

DoelDes[1:10, ]
```

Converting the data into a horizontal data frame in order to carry out the descriptive analysis

```
HorizonDes <- spread(DoelDes, key=Rank, value=Traject)

HorizonDes[1:10, ]
```

Check how many girls and boys were present in the target group

```
HorizonDes%>%
  count(Geslacht)
```

Check the ages of the children in the target group

```
HorizonDes%>%
  count(Leeftijd_begin)
```

Check whether the ages are distributed normally

```
hist(HorizonDes$Leeftijd_begin)
```

Perform the Kernel density plot

```
DensityD <- density(HorizonDes$Leeftijd_begin)

plot(DensityD)
```

Check the Mean of the ages for the target group

```
LeeftijdDoel <- HorizonDes$Leeftijd_begin

mean(LeeftijdDoel)
```

Standard Deviation for the ages in the target group

```
sd(LeeftijdDoel)
```

Analysis for the descriptives of the Control group

First: only select the column you need

```
ControleDes <- dplyr::select(Controle, UniekID, Geslacht, Leeftijd_begin, Traject, Rank)

ControleDes[1:10, ]
```

Converting the data into a horizontal data frame in order to carry out the descriptive analysis

```
HorizonDesControle <- spread(ControleDes, key=Rank, value=Traject)

HorizonDesControle[1:10, ]
```

Check how many girls and boys were present in the control group
```
HorizonDesControle%>%
  count(Geslacht)
```

Check the ages of the children in the control group
```
HorizonDesControle%>%
  count(Leeftijd_begin)
```

Check whether the ages were distributed normally
```
hist(HorizonDesControle$Leeftijd_begin)
```

Perform the Kernel Density plot
```
DensityC <- density(HorizonDesControle$Leeftijd_begin)

plot(DensityC)
```

Calculate the mean of the ages in the control group
```
LeeftijdControle <- HorizonDesControle$Leeftijd_begin

mean(LeeftijdControle)
```

Standard deviation for the ages in the control group
```
sd(LeeftijdControle)
```

Convert the target group into a horizontal data frame completely
First: only select the columns UniekID, Traject en Rank
```
Doel2 <- dplyr::select(Doel, UniekID, Traject, Rank)

Doel2[1:10, ]
```

Afterwards you can begin with transforming the data frame
```
HorizonDoel <- spread(Doel2, key=Rank, value=Traject)

HorizonDoel[1:10, ]
```

Transform the data frame so that all the categories that someone received are in 1 column
```
unitedDoel <- unite(HorizonDoel, "Alle_Trajecten", '1', '2', '3', '4', '5', '6', '7', '8', '9', '10',
'11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', sep = ", ")

unitedDoel
```

Remove all the NA's
```
unitedDoel$Alle_Trajecten <- gsub(", NA,", "", unitedDoel$Alle_Trajecten)

unitedDoel$Alle_Trajecten <- gsub("NA", "", unitedDoel$Alle_Trajecten)

unitedDoel$Alle_Trajecten <- gsub(" , ", "", unitedDoel$Alle_Trajecten)
```

```
unitedDoel
```

Give a better name to the data frame

```
Doelgroep <- unitedDoel
```

```
Doelgroep
```

Convert the control group into a horizontal data frame completely

First only select all the columns that you need

```
Controle2 <- dplyr::select(Controle, UniekID, Traject, Rank)
```

```
Controle2[1:10, ]
```

Afterwards you can begin with transforming the data frame

```
HorizonControle <- spread(Controle2, key=Rank, value=Traject)
```

```
HorizonControle[1:10, ]
```

Transform the data frame so that all the categories that someone received are in 1 column

```
unitedControle <- unite(HorizonControle, "Alle_Trajecten", '1', '2', '3', '4', '5', '6', '7', '8', '9',
'10', '11', '12', '13', sep = ", ")
```

```
unitedControle
```

Remove all the NA's

```
unitedControle$Alle_Trajecten <- gsub(", NA,", "", unitedControle$Alle_Trajecten)
```

```
unitedControle$Alle_Trajecten <- gsub("NA", "", unitedControle$Alle_Trajecten)
```

```
unitedControle$Alle_Trajecten <- gsub(" , ", "", unitedControle$Alle_Trajecten)
```

```
unitedControle
```

Give a better name to the data frame

```
Controlegroep <- unitedControle
```

```
Controlegroep
```

Check the descriptives of the trajectories of target group and control group

```
Doel2%>%
  count(Traject)
```

```
Controle2%>%
  count(Traject)
```

SPADE algorithm for the target group

Prepare the data set

Spade_Doel <- DoelDes

Spade_Doel[1:10,]

You do not need 'Geslacht' and 'Leeftijd', only select the columns you need

Spade_Doel <- dplyr::select(Spade_Doel, UniekID, Traject, Rank)

as(Spade_Doel, "data.frame")

Change the names of the columns for the Spade algorithm

You need to make sure that the items (the transactions) are in the last columns (otherwise it is not readable for the algorithm)

Spade_Doel <- transmute(Spade_Doel, sequenceID=UniekID, eventID=Rank, items=Traject)

Spade_Doel[1:10,]

Transform the data into a transaction matrix

Spade_Doel <- data.frame(lapply(Spade_Doel, as.factor))

write.table(Spade_Doel, "mySpadeD5.txt", sep=";", row.names=FALSE, col.names=FALSE, quote=FALSE)

Read the transaction matrix back into R

SDoel_Matrix <- read_baskets("mySpadeD5.txt", info=c("sequenceID", "eventID"), sep=";")

Performing the Spade algorithm for the target group

CSDoel <- cspade(SDoel_Matrix, parameter = list(support=0.1), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSDoel)

Request the frequent sequences

as(CSDoel, "data.frame")

Spade specifically for Foster care

From the mySpadeD5 file, only children who have ever had foster care in their path have been selected. This text.file is saved as Pleegzorg.txt

SPleegzorg <- read_baskets("Pleegzorg.txt", info=c("sequenceID", "eventID"), sep=";")

CSPleegzorg <- cspade(SPleegzorg, parameter = list(support=0.2), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSPleegzorg)

Request the frequent sequences
as(CSPleegzorg, "data.frame")

Spade specifically for Staying over
From the mySpadeD5 file, only children who have ever had Staying over in their path have been selected. This text.file is saved as Logeren.txt
SLogeren <- read_baskets("Logeren.txt", info=c("sequenceID", "eventID"), sep=";")

CSLogeren <- cspade(SLogeren, parameter = list(support=0.6), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSLogeren)

Request the frequent sequences
as(CSLogeren, "data.frame")

Spade specifically for Family home
From the mySpadeD5 file, only children who have ever had Family home in their path have been selected. This text.file is saved as Gezinshuis.txt
SGezin <- read_baskets("Gezinshuis.txt", info=c("sequenceID", "eventID"), sep=";")

CSGezin <- cspade(SGezin, parameter = list(support=0.6), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSGezin)

Request the frequent sequences
as(CSGezin, "data.frame")

Spade specifically for Essential functions
From the mySpadeD5 file, only children who have ever had Essential functions in their path have been selected. This text.file is saved as Essentieel.txt
SEssentieel <- read_baskets("Essentieel.txt", info=c("sequenceID", "eventID"), sep=";")

CSEssentieel <- cspade(SEssentieel, parameter = list(support=0.4), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSEssentieel)

Request the frequent sequences
as(CSEssentieel, "data.frame")

Spade specifically for Crisis stay
From the mySpadeD5 file, only children who have ever had Crisis stay in their path have been selected. This text.file is saved as 'Crisis verblijf.txt'
SCrisis <- read_baskets("Crisis verblijf.txt", info=c("sequenceID", "eventID"), sep=";")

CSCrisis <- cspade(SCrisis, parameter = list(support=0.4), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSCrisis)

Request the frequent sequences
as(CSCrisis, "data.frame")

Prepare the control group for Spade algorithm
First prepare the data
Spade_Controle <- ControleDes

Spade_Controle[1:10,]

You do not need 'Geslacht' and 'Leeftijd', only select the columns you need
Spade_Controle <- dplyr::select(Spade_Controle, UniekID, Traject, Rank)

as(Spade_Controle, "data.frame")

Change the names of the columns for the Spade algorithm
You need to make sure that the items (the transactions) are in the last columns (otherwise it is not readable for the algorithm)
Spade_Controle <- transmute(Spade_Controle, sequenceID=UniekID, eventID=Rank, items=Traject)

Spade_Controle[1:10,]

Transform the data into a transaction matrix
Spade_Controle <- data.frame(lapply(Spade_Controle, as.factor))

write.table(Spade_Controle, "mySpadeC.txt", sep=";", row.names=FALSE, col.names=FALSE, quote=FALSE)

Read the transaction matrix back into R
SControle_Matrix <- read_baskets("mySpadeC.txt", info=c("sequenceID", "eventID"), sep=";")

Perform the Spade algorithm for the control group
CSControle <- cspade(SControle_Matrix, parameter = list(support=0.1), control=list(verbose=TRUE, tidLists=TRUE))

summary(CSControle)

Request the frequent sequences
as(CSControle, "data.frame")

Preparing for Logistic regression
Read the data into R form excel
Totaal <- read_excel('WERKDATASET2.xlsx')

View(Totaal)

Select only the columns you need
Totaal <- dplyr::select(Totaal, UNIEK_ID, Geslacht, Leeftijd_begin, Traject, Rank, Groep)

View(Totaal)

Transform the data into a horizontal data set with spread and unite
HorizonTotaal <- spread(Totaal, key=Rank, value=Traject)

unitedTotaal <- unite(HorizonTotaal, "Alle_Trajecten", '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', sep = ", ")

Remove all the NA's
unitedTotaal$Alle_Trajecten <- gsub(", NA,", "", unitedTotaal$Alle_Trajecten)

unitedTotaal$Alle_Trajecten <- gsub("NA", "", unitedTotaal$Alle_Trajecten)

unitedTotaal$Alle_Trajecten <- gsub(" , ", "", unitedTotaal$Alle_Trajecten)

unitedTotaal[1:10,]

Write the data into excel
write.xlsx(unitedTotaal, file="Totaal2.xlsx")

A copy is made from Totaal2.xlsx named **Totaal.xlsx.**

In this document:

- **Gender:** Female and Male were indicated with V and M and were transformed so that V = 1 and M = 0
- The variable **Out-of-home placement** is also added and stands for Target group = 1 and control group = 0. This is done by copying the column 'Out-of-home placement' from the excel file WERKDATASET.xlsx to Clusterdata.xlsx, and then change 'Doel' to 1 and 'Controle' to 0.
- In this document the **names of the categories are changed** so that Pleegzorg=P etc

Jeugd en Opvoedhulp = J
Persoonlijke verzorging = D
Consultatie = C
Logeren = L
Essentiële functies =E
Basis GGZ= B
Specialistische GGZ=S
Gezinshuis= G

Crisis verblijf=H
Pleegzorg= P
Vervoer=V
Voogdij=Z
Kindergeneeskunde=K
Ondertoezichtstelling = O
In verbinding thuis en groep = I

This results in Excel in a data set like this:

ID	**Out-of-home placement**	**Age**	**Gender**	**Trajectories**
111111	**1**	**8**	**V**	**J,S,S,P**
22222	**0**	**10**	**M**	**P,V,B**
33333	**1**	**6**	**M**	**S,S,H,E**

The next step is to put each of the types of care in a separate column, where each column counts how often that form of care is administered per child. This is done by applying a formula in Excel:

- **Example**: You want to know how often S appeared per child. The formula is written in column J2 so that the results of the formula will appear in this column. **Formula: = LENGTH (E2) LENGTH (SUBSTITUTE (E2; "S"; ""))** (so it calculates how often S occurs in E2).

This then results in:

ID	**Out-of-home placement**	**Age**	**Gender**	**Trajectories**	**S**
111111	**1**	**8**	**V**	**J,S,S,P**	**2**
22222	**0**	**10**	**M**	**P,V,B**	**0**
33333	**1**	**6**	**M**	**S,S,H,E**	**2**

This is then done for each form of care, so that a new column is created for each form of care.

The new table that is created is pasted into the new excel file **Clusterdata.xlsx**

Then a copy is made from the Clusterdata.xlsx named **Kopie_clusterdata.xlsx**. In this document a new variable is added: **Leeftijd_2**

- **Leeftijd_2** was added as a recoded version of the variable **Leeftijd_begin** since this variable had a negative value -1. In order to recode this variable, two years was added to each age. This meant that -1 became 1, 0 became 2 etc.
    - This is new column is created in excel by the formula **=B2+2 (**B2 is the column of Leeftijd_begin).

After this is done, the dataset is exported to a CSV file named **Kopie_clusterdata.csv**

Read the data back into R
Log_data <- read_csv('Kopie_clusterdata.csv', sep=";", header=T)

View(Log_data)

Split the data
library(caTools)

set.seed(14)

Split <- sample.split(Log_data, SplitRatio = 0.8)

Split

Train <- subset(Log_data, Split=="TRUE")

Test <- subset(Log_data, Split=="FALSE")

Transform the variables 'Gender' , 'Out_of_home placement' and 'Total_outofhome' into factors
Log_data$Geslacht <- as.factor(Log_data$Geslacht)

Log_data$Out_of_home_placement <- as.factor(Log_data$Out_of_home_placement)

Log_data$Totaal_uithuis <- as.factor(Log_data$Totaal_uithuis)

Check how gender is distributed in out-of-home placement (yes/no)
xtabs(~ Out_of_home_placement + Geslacht, data=Log_data)

Check how 'age at the beginning of the trajectory' is distributed in out-of-home placement (yes/no)
xtabs(~ Out_of_home_placement + Leeftijd_begin, data=Log_data)

Logistic regression with age at first contact and gender as independent variables and out_of_home_placement as dependent variable
mymodel_2 <- glm(Out_of_home_placement ~ Geslacht + Leeftijd_2, data = Train, family='binomial')

summary(mymodel_2)

Check whether the regression analysis meets the requirements of multicollinearity and outliers
Check multicollinearity
library(car)

```
vif(mymodel_2)
```

Check for outliers

```
library(broom)

library(magrittr)

model_data <- augment(mymodel_2) %>%
  mutate(index=1:n())

model_data %>% top_n(3, .cooksd)

ggplot(model_data, aes(index, .std.resid)) +
    geom_point(aes(color=Out_of_home_placement),   alpha=.5)+theme_bw()
```

Obtaining the odds ratios

```
library(questionr)

odds.ratio(mymodel_2, level=0.95)
```

Odds ratio as percentage

```
(exp(coef(mymodel_2))-1)*100
```

Likelihood ratio test to check whether logistic regression with independent variables outperformed the logistic regression without independent variables

First perform logistic regression without independent variables

```
mymodel_leeg <- glm(Out_of_home_placement ~ NULL, data = Train, family='binomial')

summary(mymodel_leeg)
```

Then perform the likelihood ratio test

```
anova(mymodel_2, mymodel_leeg, test="Chisq")
```

Calculate the Psuedo R2

```
library(pscl)

pR2(mymodel_2)
```

Hosmer-Lemeshow test
library(ResourceSelection)

hoslem.test(Train$Out_of_home_placement, fitted(mymodel_2), g=4)
p < 0.05 which indicates that H0 is rejected and the model is not well specified and is not a good fit

Independent sample T test to check whether the occurrence of care differs significantly between the target group and the control group
Create a variable for out-of-home placement (yes/no)
Uithuis <- Log_data$Out_of_home_placement

Transform Out-of-home placement into a numeric factor
as.numeric(Uithuis)

T-test to check whether B-GGZ differs significantly between target and control group
t.test(Log_data$Basis_GGZ~Uithuis)

T-test to check whether J&O differs significantly between target and control group
t.test(Log_data$Jeugd_en_Opvoedhulp~Uithuis)

T-test to check whether S-GGZ differs significantly between target and control group
t.test(Log_data$Specialistische_GGZ~Uithuis)

T-test to check whether Consultatie differs significantly between target and control group
t.test(Log_data$Consultatie~Uithuis)

Appendix

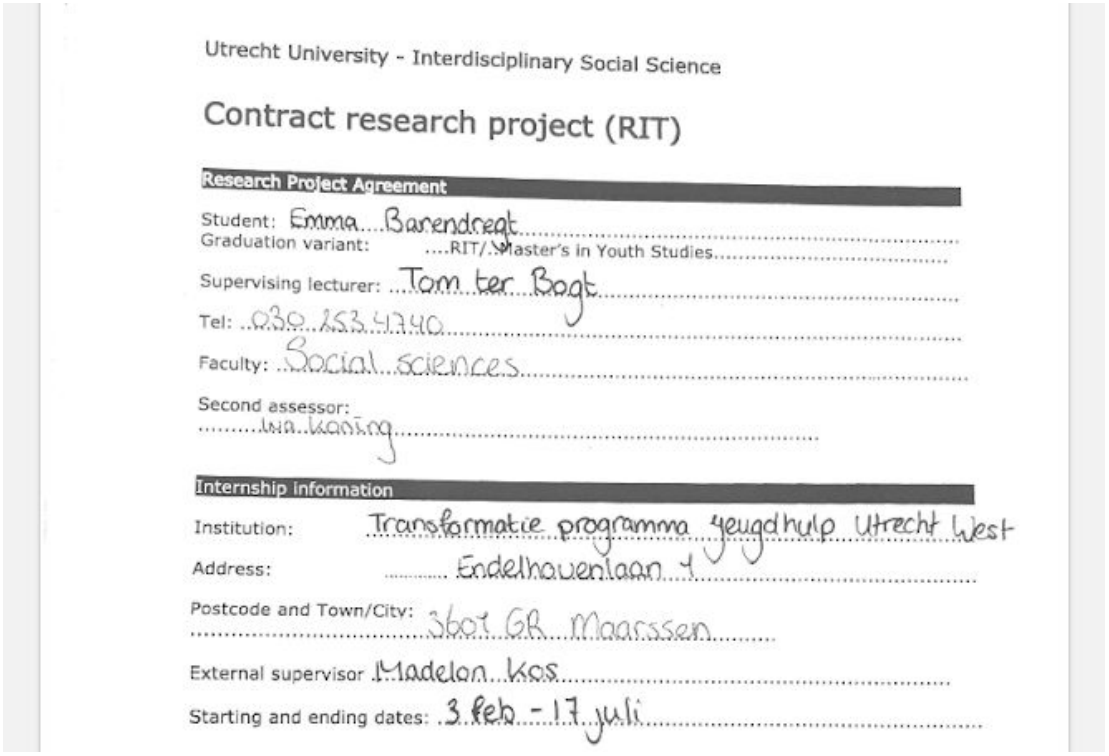
Appendix I. The interdisciplinarity of this research

This study is interdisciplinary due to the combination of contextual and individual components; the study investigates the structure of subsequent youth care trajectories and the influence of gender and age on this structure.

Since the out-of-home placement is influenced on multiple levels (individual, environmental, contextual), the use of multiple theoretical insights from other disciplines could contribute to a better understanding of the paths which lead to out-of-home placement. It can be useful to examine how parents can influence the chance of out-of-home placement and whether the paths that lead to out-of-home placement are influenced by characteristics of the parents. This is interesting to study since the income of the parents, their own criminal behavior, their psychological and addiction problems, their age of first birth, and the household composition all influence the chance of having their children taken into out-of-home care (Barth, Wildfire, and Green, 2006; Bot, et al., 2013; Philips, Burns, Wagner, and Barth, 2004;), and these factors might also influence the youth care trajectories their child received which preceded their out-of-home placement. Furthermore, it can be interesting to study whether the organization of the youth services influences the paths that lead to out-of-home placement because; when youth care services have a workload which is too high, it might take a while before a child is taken out-of-home due to time constraints, influencing their path preceding out-of-home placement. However, due to privacy and legal concerns, no other factors from the parents and/or the child could be added, and no factors were present about the organization of the youth care providers.

With regards to the research methods; both R and SPSS will be used to investigate the research question. The programming language R will be used to apply data mining techniques (cSPADE and Cluster analysis) in order to find the relevant patterns of care in the data.

Appendix II. Contract research project RIT track



Utrecht University - Interdisciplinary Social Science

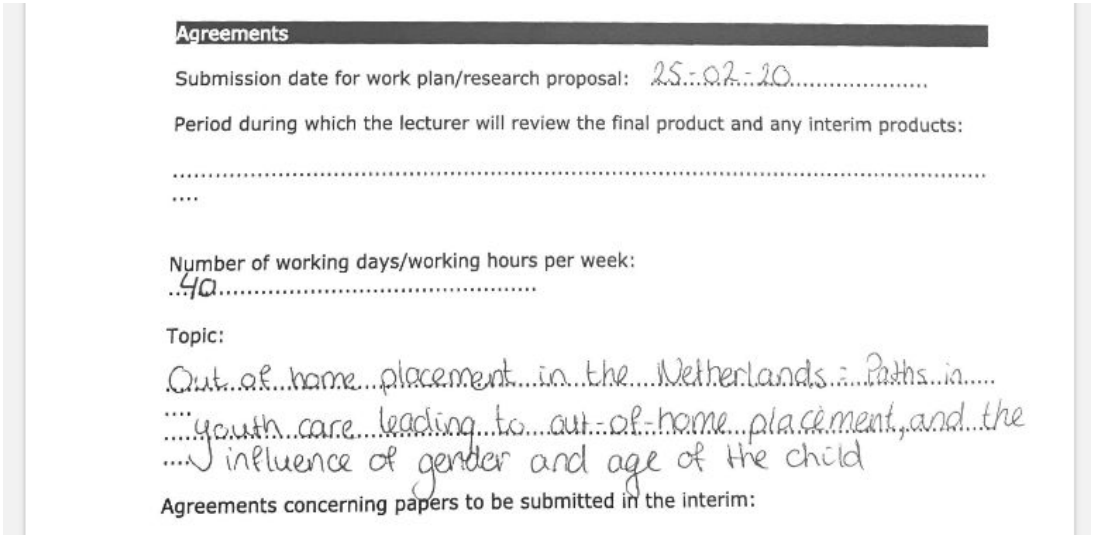
Contract research project (RIT)

Research Project Agreement

Student: Emma Barendregt
Graduation variant: ....RIT/Master's in Youth Studies
Supervising lecturer: Tom ter Bogt
Tel: 030 253 4740
Faculty: Social sciences
Second assessor: Ina Koning

Internship information

Institution: Transformatie programma jeugdhulp Utrecht West
Address: Endelhaven laan 4
Postcode and Town/City: 3607 GR Maarssen
External supervisor Madelon Kos
Starting and ending dates: 3 feb - 17 juli



Agreements

Submission date for work plan/research proposal: 25-02-20

Period during which the lecturer will review the final product and any interim products:

Number of working days/working hours per week:
40

Topic:

Out of home placement in the Netherlands: Paths in youth care leading to out-of-home placement, and the influence of gender and age of the child

Agreements concerning papers to be submitted in the interim:

The client (host institution or faculty/programme) will provide the facilities needed in order to conduct the assignment properly.

If applicable:
Form and frequency of supervision within the host institution:

weekly

Number of conferences between the supervising lecturer and the supervisor within the host institution:

1

Prescriptions concerning the confidentiality of information:

Integrity check form and confidentiality form

Ownership of the research data, in the event of deviation from the rule (see 16):

Stichtse Vecht municipality

Right to publish based on the research data:

Signed as approved,

Location/date: 25 february

Signature of the student: [ ]

Signature of the supervising lecturer:

Signature of the external supervisor (if applicable) [ ]

Signature of the Course Coordinator [ ]