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Characteristics and treatment outcomes of children and adolescents accessing treatment in Child and Youth Mental Health Services

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Abstract

Aim: To provide insight into the characteristics and treatment outcomes of children and adolescents accessing outpatient Child and Youth Mental Health Services (CYMHS), and to explore whether outcomes differ by age, sex, and ancestry background. This information can guide how to optimize the treatment delivered at these services.

Methods: An observational retrospective study was performed based on data from 3098 children and adolescents between age 5 and 18 who received treatment at Brisbane, Australia, community CYMHS between 2013–2018. Patient characteristics, service use, and clinician and parent rated Routine Outcome Measures (ROM) were extracted from electronic health records.

Results: Anxiety and mood disorders were the most common mental disorders (37% and 19%). In 1315 children and adolescents (42%), two or more disorders were diagnosed, and the far majority (88%) had experienced at least one psychosocial stressor. The ROM scores improved between start and end of treatment with Cohen's *d* effect sizes of around 0.9. However, ~50% of the children still scored in the clinical range at the end of treatment. Outcomes did not differ over gender and Indigenous status.

Conclusions: Children and adolescents accessing CYMHS have severe and complex mental disorders as reflected by high rates of comorbidity, exposure to adverse circumstances and high symptom scores at the start of treatment. Despite the clinically relevant and substantial improvement, end ROM scores indicated the presence of residual symptoms. As this increases the risk for relapse, services should explore ways to improve treatment to further reduce mental health symptoms.

KEYWORDS
children and adolescent psychiatry, community Child and Youth Mental Health Service, observational study, Routine Outcome Measures, treatment outcome

1 | INTRODUCTION

Population-based longitudinal studies have indicated that child and adolescent psychiatric disorders can continue into adulthood and result in a range of poor functional outcomes in the areas of health, education and income, social and family functioning (Costello & Maughan, 2015). Specialized outpatient child and youth mental health services provide support to children and adolescents with complex mental health needs, who, due to the complexity of issues, are at increased risk for persistence of symptoms. Gaining knowledge on the clinical and demographic characteristics of these children and adolescents, and especially their treatment outcomes, is an essential first step to be able to optimize treatment for this group in high need to reduce persistence as much as possible.

However, information on "real world" outcomes, that is, not obtained in the framework of a clinical trial, is limited. So far, there have been two largescale studies including children as well as adolescents (Lundh et al., 2013; Wolpert et al., 2016). In 3707 and 5896 children (between 0 to 25 years) from the UK, pre and post parent and child measures showed that treatment effect sizes ranged from 0.58 to 0.93 on the various measures, that is, a substantial average improvement (Wolpert et al., 2016). Still, only 41% of parents and 52% of children reported reliable improvement, while 51% and 38% reported no change and 9% and 11% reported reliable deterioration. Another study on 12 614 children aged between 0 to 18 years, also observed significant improvement, with effect sizes for most disorders above 0.7 on the Children's Global Assessment Scale (CGAS) scores (Lundh et al., 2013). Smaller studies on 203, 531, 911, and 934 children and adolescents attending child and youth mental health services reported similar results (Bonadio & Tompsett, 2018; Brann & Coleman, 2010; Garralda et al., 2000; Murphy et al., 2015).

Overall, these studies suggest reasonable treatment outcomes in outpatient child and youth mental health services. However, apart from the limited number of studies available, most of the studies analysed only one outcome measure and did not report detailed information on the children included in the study or on factors associated with the outcomes. The introduction of electronic medical records and the implementation of the Mental Health National Outcomes and Casemix Collection (NOCC) providing guidelines for obtaining Routine Outcome Measures (ROM) in Australian public mental health services (AMHOCN, 2009) provided an opportunity to extend the existing literature.

We analysed data from children up to age 18 in treatment of public, that is, government funded, free community Child and Youth Mental Health Services (CYMHS). These services focus on children with complex mental health needs and provide specialized care. Treatment is provided by multidisciplinary teams, consisting of child and adolescent psychiatrists, psychologists, social workers, occupational therapists, and speech pathologists and include pharmacological and non-pharmacological interventions, such as psychotherapy and parental guidance. There is no definition of complex mental health needs and, accordingly, there are no clear criteria that community CYMHS use to decide whether a child is accepted to their service. Therefore, our first aim was to provide insight into the population attending CYMHS by describing the severity and complexity of the mental disorders they

experience and their service use. Next, we explored the effects of treatment as reflected by the change in outcome scores between start and end of treatment and the proportions of children scoring in the non-clinical range at the end of treatment. We also tested whether outcomes differed over gender and ancestry, that is, Indigenous background or not.

2 | METHODS

2.1 | Participants

In the greater area of Brisbane, Australia, public CYMHS, as part of Children's Health Queensland Hospital and Health Service (CHQHHS), provide a variety of treatment services for child and youth mental health, including inpatient units, perinatal and infant mental health service, day programs and community services. For this study, we focused on the seven community CYMHS that provide outpatient treatment to children aged between 5 up to 18 years that live in the catchment of the greater area of metropolitan Brisbane. Data obtained from children that entered the service between January 2013 to December 2017 were extracted from electronic health records. To be able to compare outcomes before and after treatment, only children with a clinical episode duration of >30 days were included. If children had multiple clinical episodes between 2013 and 2017, we selected the first treatment episode for the analysis. To report exclusively on community-based treatment, children and adolescents who were admitted into an acute mental health inpatient unit while being managed by community CYMHS were also excluded.

Ethical approval for use of the data in a de-identified manner was obtained with the Human Research Ethics Committee of Children's Health Queensland (HREC/17/QRCH/321). It was further approved by the Health Innovation, Investment and Research Office (HIIRO), Queensland Health, in accordance with the Public Health Act 2005.

2.2 | Demographic information

Demographic information included gender, age at start of each episode, Indigenous status, country of birth, preferred language, and residing suburb. Indigenous status is defined as identifying as Aboriginal and/or Torres Strait Islanders, which are the First Nations people of Australia. Suburb postal codes were cross matched against the 2016 Australian Socio-Economic Indexes for Areas from the Australian Bureau of Statistics (https://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001). This ranks areas in Australia according to relative socio-economic advantage and disadvantage indicating suburb performance in comparison to the rest of the nation.

2.3 | Diagnoses and service use

Primary and secondary diagnoses were collected at every case review by the multidisciplinary community CYMHS teams, including senior

clinicians, and classified according to the International Statistical Classification of Diseases, 10th revision (ICD-10) (WHO, 2016) classifications for Mental, Behavioural and Neurodevelopmental disorders (codes F00-99), and the factors influencing health status and contact with health services (codes Z00-99). Diagnoses were made based on the information obtained from the parents and child in unstructured diagnostic interviews, sometimes combined with extra collateral information, for example, from a teacher. All diagnoses were included for this study and similar diagnoses were combined into major groups.

Information on service use consists of number of clinical episodes and duration of the first clinical episode within the time frame, that is, the episode for which the ROM data were analysed. A clinical episode is ended when the child is discharged from the service, either in mutual agreement or after dropout of the child. Data on reason for discharge was not available.

2.4 | Routine Outcome Measures

ROM were assessed following the National Outcomes and Casemix Collection recommendations for child and youth mental health services (AMHOCN, 2009), which requires regular scoring of the Health of the Nation Outcome Scales Child and Adolescent Mental Health (HoNOSCA), Children's Global Assessment Scale (CGAS), and Strengths and Difficulties Questionnaire (SDQ).

The HoNOSCA is a 15-item clinician-rated measurement designed to assess child and adolescent outcomes in mental health services and includes including four subscales: behavioural (BEH), symptomatic (SYP), and social problems (SOC), and impairment (IMP) and a total score based on questions 1 to 13 (Gowers et al., 1999). Question 14 and 15 were excluded because these pertained to parental knowledge about the children's difficulties and services available to them (Pirkis, Burgess, Kirk, Dodson, Coombs, & Williamson, 2005).

The CGAS is a clinician-rated measure and provides a global level of adjustment and functioning of clients' abilities to carry out different activities in different settings such as at home, school, or with peers on a scale of 1 to 100, focusing on the lowest level of functioning in the last month (Shaffer et al., 1983).

Clinician-rated ROM (CGAS and HoNOSCA) were completed by the health care professional responsible for the child, including child- and adolescent psychiatrists, psychologists, social workers, or occupational therapists. All clinicians were offered training to rate these measures. However, completion rates of the training are not available. This means that sometimes questionnaires may have been completed by untrained clinicians. For both instruments, inter-rater reliability has been reported to be good (Pirkis, Burgess, Kirk, Dodson, & Coombs, 2005; Pirkis, Burgess, Kirk, Dodson, Coombs, & Williamson, 2005).

We analysed the 25-item parent-rated SDQ that includes five subscales: emotional (EPS), conduct (CPS), hyperactivity (HAS), peer relationship problems (PPS), and prosocial behaviours (PSS) over the past 6 months (Goodman et al., 2000) and a Total Difficulties Score

(TDS) which is the sum of all subscales except the prosocial subscale. We did not analyse the self-report SDQ as that can only be used in children over 11 years of age and response rates were low.

If, according to the NOCC criteria, there were too many items missing for a (sub)scale, this score was coded as missing (AMHOCN, 2009). For patients with valid but incomplete ROM, Multiple Imputations in SPSS were used to generate missing values by maintaining the variance and covariances of individual/global scores (Schlomer et al., 2010).

2.5 | Statistical analyses

Analyses were carried out with SPSS version 25 (IBM, 2017). Sixty-nine tests were performed. As not all these tests were entirely independent, a p-value threshold of $.05/69 = .0007$ would be too conservative, thus we considered a p-value of <.001 as statistically significant.

Using Chi Square tests, we tested for differences in diagnoses prevalence rates between gender, Indigenous and non-Indigenous people and up to age 11 and above age 11 (these age groups are in line with the report on the mental health of Australian children (Lawrence et al., 2015)). Differences across these groups in ROM scores at start and end were tested by two sample T-tests. One sample T-tests were used to analyse individual differences in start, midway and end ROM scores, and Cohen's d effect sizes and confidence intervals for improvement in ROM scores between these time points were calculated (Cohen, 1988; Wuensch, 2012). Midway was defined as within 3 months from the middle timepoint between the first and last appointment. If the treatment ended within this timeframe, there was no midway timepoint.

Finally, we report the proportion of children that improved, deteriorated or were stable between start and end of treatment based on the reliable change index (Parabiaghi et al., 2005) and the proportion of children whose score was still in the clinical range at the end of the treatment.

3 | RESULTS

3.1 | Overview sociodemographic characteristics and service use

There were 3098 children who attended treatment in community CYMHS between 2013 and 2018 (Table 1). Females were slightly overrepresented (55%) as well as children older than 11 years of age (66%). Eight percent of the children identified themselves as Aboriginal and/or Torres Strait Islanders. The families resided in moderately advantaged socio-economic suburbs with the average suburb index score at the 61.5th percentile and only 23% of children living in suburb areas with index scores in the two lowest quartiles, that is, where 50% of the general population in Australia is living.

TABLE 1 Sociodemographic, clinical and service use characteristics of children and adolescents receiving treatment in community child and youth mental health service in the greater area of Brisbane

Number	3098
Gender	
Male	1385 (44.7%)
Female	1712 (55.3%)
Other	1 (0.03%)
Indigenous status	
Neither Aboriginal nor Torres Strait Island origin	2856 (92.2%)
Torres Strait Islander but Not Aboriginal origin	12 (0.4%)
Aboriginal but Not Torres Strait Islander origin	210 (6.8%)
Both Aboriginal and Torres Strait Islander origin	20 (0.6%)
Average age (SD) at episode start	12.5 (3.4)
Number of >11 years of age (%)	2037 (65.8%)
% Female ≤11 years of age	38.7%
% Female >11 years of age	63.9%
Preferred language as English %	98.1%
Mean Global suburb index scores (SD)/percentile	1015.8 (62.0) /61.5
% of children in suburb with index in lowest quartile	10.5%
% of children in second lowest quartile	12.6%
% of children in second highest quartile	42.7%
% of children in highest quartile	34.2%
Country of Birth	
Australia	89.7%
New Zealand	3.2%
England	1.6%
Others	5.5%
Number F-code diagnoses (%)	
0	179 (5.8%)
1	1604 (51.8%)
2	857 (27.7%)
≥3	458 (14.8%)
Number Z-code diagnoses (%)	
0	347 (11.2%)
1	592 (19.1%)
2	824 (26.6%)
≥3	1335 (43.1%)
Average number of episodes (SD) (range)	1.1 (0.3) (1 to 5)
% Children with 1 episode	93.6%
% Children with 2 episodes	5.7%
% Children with >2 episodes	0.7%
Average length of episodes in days (SD) (range)	231.1 (180) (30 to 1695)
% Children with length of episode 30 to 90 days %	20.6%
% Children with length of episode 91 to 180 days	31.4%
% Children with length of episode 181 to 365 days	30.8%
% of children with length of episode >1 year	17.3%

The far majority (93.6%) only had one episode of care. These episodes lasted, on average, around 8 months, although halve of the children had an episode of 6 months or shorter.

3.2 | Diagnoses and environmental stressors

Table 1 shows the number of diagnoses as defined by the ICD-10: Mental, Behavioural and Neurodevelopmental disorders (codes F00-99), and the number of factors influencing health status, the ICD-10 Z-codes. Six percent did not have a psychiatric diagnosis reported in the electronic health record, 52% had one diagnosis, and 42% had two or more diagnoses. The majority (89%) had at least one Z-code diagnosis, indicating the exposure to psychosocial stressors, and 70% even had two or more Z-code diagnoses.

After combining psychiatric diagnoses into several main groups (see Appendix, Table A1 for the list of diagnoses included in each category), anxiety disorders was the most common diagnostic group, followed by mood, stress and adjustment disorders, developmental disorders and attention deficit hyperactivity disorders (Table 2). The prevalence rates of psychiatric diagnoses followed the well-known gender and age patterns. Internalizing disorders were more prevalent in girls and in children above 11 years of age, while ADHD and conduct disorders were more prevalent in males and developmental disorders more prevalent in children below 12 years of age.

Regarding the Z-code diagnoses (Table 3), the majority of children had problems related to primary support group, followed by a family history of mental health disorders and problems related to negative life events in childhood. There were many differences between gender and age-groups in the prevalence of Z-codes with some issues more prevalent in males than females or more prevalent in children ≤11 than >11 years, but also the other way around.

There were no significant differences between Non-Indigenous and Indigenous children for both F- and Z-code diagnoses.

3.3 | ROM treatment outcomes

Completion rates for clinicians were higher than for parents: 10% of parents completed the SDQ halfway treatment and 15% at the end of treatment compared to 38% and 65% of clinicians who completed the HoNOSCA. The start CGAS score corresponded to moderate impairment and the parental SDQ score corresponded to very high impairment (AMHOCN, 2003; Wagner et al., 2007). For all three measures, average scores incrementally improved from start to middle to end (Table 4). The overall effect sizes as expressed in Cohen's d varied between 0.68 (95% confidence interval [CI] 0.57–0.79) and 1.01 (95% CI 0.94–1.08) from start to end for HoNOSCA, CGAS, and SDQ, with improvement in both first and second halves of treatment (Table 5). In males and Indigenous children some of the start scores were significantly worse compared to females or non-Indigenous children but there were no significant difference for end values (Figure 1a,b,c), or for the duration of treatment and number of episodes.

TABLE 2 Prevalence rates of psychiatric diagnoses in the total population and across gender, age, and ancestry background

| | Total % | Age ≤ 11 | | | | Age > 11 | | | | p-values (significant if p < .001) | | |
| | | Indigenous | | Non-indigenous | | Indigenous | | Non-indigenous | | | | |
		Males n = 63	Females n = 33	Males n = 587	Females n = 378	Males n = 47	Females n = 99	Males n = 689	Females n = 1202	Male to female	Indigenous to non-Indigenous	Age ≤ 11 to Age > 11
Anxiety disorders	1137 36.7%	14 22.2%	11 33.3%	184 31.3%	150 39.7%	10 21.3%	26 26.3%	259 37.6%	483 40.2%	<.001	N-S	<.001
Mood disorders	589 19.0%	2 3.2%	1 3.0%	11 1.9%	13 3.4%	8 17.0%	32 32.3%	186 27.0%	337 28.0%	N-S	N-S	<.001
Stress disorders	480 15.5%	14 22.2%	7 21.2%	53 9.0%	55 14.6%	13 27.7%	29 29.3%	77 11.2%	231 19.2%	<.001	N-S	<.001
Adjustment disorders	443 14.3%	10 15.9%	6 18.2%	67 11.4%	44 11.6%	6 12.8%	17 17.2%	115 16.7%	179 14.9%	<.001	N-S	<.001
Developmental disorders	319 10.3%	14 22.2%	4 12.1%	113 19.3%	68 18.0%	2 4.3%	6 6.1%	63 9.1%	50 4.2%	N-S	N-S	<.001
Attention deficit hyperactivity disorders	319 10.3%	13 20.6%	5 15.2%	139 23.7%	45 11.9%	10 21.3%	2 2.0%	75 10.9%	29 2.4%	<.001	N-S	N-S
Emotional and social disorders onset children and adolescent	288 9.3%	12 19.0%	7 21.2%	95 16.2%	72 19.0%	6 12.8%	5 5.1%	41 6.0%	50 4.2%	N-S	N-S	N-S
Other behavioural and emotional disorders	143 4.6%	6 9.5%	1 3.0%	50 8.5%	45 11.9%	1 2.1%	1 1.0%	16 2.3%	23 1.9%	N-S	N-S	N-S
Conduct disorders	112 3.6%	2 3.2%	1 3.0%	52 8.9%	8 2.1%	4 8.5%	0 0%	36 5.2%	10 0.8%	<.001	N-S	N-S
Mixed disorders of conduct and emotions	108 3.5%	5 7.9%	2 6.1%	30 5.1%	12 3.2%	4 8.5%	4 4.0%	30 4.4%	22 1.8%	N-S	N-S	N-S
Other psychiatric diagnoses	465 15.0%	7 11.1%	3 9.1%	59 10.1%	36 9.5%	6 12.8%	13 13.1%	125 18.1%	215 17.9%	N-S	N-S	<.001
No psychiatric diagnoses	180 5.8%	4 6.3%	2 6.1%	39 6.6%	31 8.2%	3 6.4%	9 9.1%	30 4.4%	61 5.1%	N-S	N-S	N-S

Note: Diagnoses are not mutually exclusive. Appendix, Table A1 provides which F-codes are included in the diagnostic categories. N-S, non-significant.

TABLE 3 Prevalence rates of Z-code diagnoses in the total population and across gender, age, and ancestry background

| | Total % | Age ≤ 11 | | | | Age > 11 | | | | p-values (significant if p < .001) | | |
| | | Indigenous | | Non-indigenous | | Indigenous | | Non-indigenous | | | | |
		Males n = 63	Females n = 33	Males n = 587	Females n = 378	Males n = 47	Females n = 99	Males n = 689	Females n = 1202	Male to female	Indigenous to non-indigenous	Age ≤ 11 to Age > 11
Z63 Problems related to primary support group	1726 55.7%	36 57.1%	22 66.7%	307 52.3%	211 55.8%	17 36.2%	48 48.5%	374 54.3%	709 59.0%	<.001	N-S	<.001
Z81 Family history of mental and behavioural disorders	1648 53.2%	36 57.1%	19 57.6%	312 53.2%	227 60.1%	24 51.1%	46 46.5%	342 49.6%	641 53.3%	<.001	N-S	<.001
Z61 Problems related to negative life events in childhood	1199 38.7%	30 47.6%	18 54.5%	204 34.8%	145 38.4%	20 42.6%	37 37.4%	235 34.1%	508 42.3%	<.001	N-S	<.001
Z60 Problems related to social environment	740 23.9%	18 28.6%	9 27.3%	133 22.7%	83 22.0%	7 14.9%	19 19.2%	162 23.5%	310 25.8%	<.001	N-S	<.001
Z55 Problems related to education and literacy	530 17.1%	11 17.5%	2 6.1%	119 20.3%	47 12.4%	9 19.1%	11 11.1%	150 21.8%	180 15.0%	<.001	N-S	<.001
Z62 Other problems related to upbringing	452 14.6%	13 20.6%	5 15.2%	83 14.1%	73 19.3%	6 12.8%	16 16.2%	90 13.1%	167 13.9%	<.001	N-S	<.001
Other Z-code diagnoses	778 25.1%	8 12.7%	7 21.2%	67 11.4%	61 16.1%	5 10.6%	24 24.2%	177 25.7%	430 35.8%	<.001	N-S	<.001
No Z-code diagnoses	347 11.2%	6 9.2%	3 8.8%	81 13.8%	42 11.1%	10 21.3%	17 16.9%	72 10.4%	118 9.8%	<.001	N-S	<.001

Note: Diagnoses are not mutually exclusive. N-S, non-significant.

TABLE 4 Completion rates, average scores (SD), and % in clinical range for ROM at the start, middle, and end of treatment

ROM	ROM at start	ROM at middle	ROM at end
HoNOSCA (N/%)	2698 (87.1%)	1188 (38.3%)	2019 (65.2%)
Total	15.6 ± 6.0	12.3 ± 6.1	10.1 ± 6.7
% Clinical range	88.3%	70.1%	53.5%
BEH	4.0 ± 2.7	2.8 ± 2.3	2.2 ± 2.3
IMP	1.6 ± 1.7	1.3 ± 1.6	1.2 ± 1.5
SYP	4.0 ± 1.8	3.2 ± 1.7	2.5 ± 1.7
SOC	6.0 ± 3.0	5.0 ± 3.0	4.2 ± 3.1
CGAS (N/%)	2720 (87.8%)	1570 (50.7%)	2185 (70.5%)
Score	54.1 ± 9.6	60.0 ± 10.7	65.1 ± 12.1
% Clinical range	91.6%	78.0%	57.6%
SDQ (N/%)	2206 (71.2%)	325 (10.5%)	456 (14.7%)
TDS	20.0 ± 6.9	17.5 ± 4.9	15.4 ± 6.7
% Clinical range	68.6%	51.7%	43.2%
EPS	6.3 ± 2.5	5.4 ± 2.7	4.3 ± 2.7
CPS	3.9 ± 2.6	3.2 ± 2.4	2.9 ± 2.3
HAS	5.9 ± 2.7	5.4 ± 2.6	5.0 ± 2.7
PPS	3.9 ± 2.2	3.5 ± 2.2	3.2 ± 2.2
PSS	6.5 ± 2.3	6.7 ± 2.2	7.2 ± 2.2

Abbreviations: BEH, Behavioural; CGAS, Children's Global Assessment Scale; CPS, Conduct; EPS, Emotional; HAS, Hyperactivity; HoNOSCA, Health of the Nation Outcome Scales Child and Adolescent Mental Health; IMP, Impairment; PPS, Peer Relationship Problems; PSS, Prosocial Behaviours; ROM, Routine Outcome Measurement; SDQ TDS, Strengths and Difficulties Questionnaire Total Difficulties Score; SOC, Social problems; SYP, Symptomatic.

TABLE 5 Improvement in ROM scores expressed in Cohen's d from start of treatment to middle and end of treatment

		95% CI			
Start to middle	Effect size	UL	LL	*t(df)*	*p*-values
HoNOSCA	+0.54 SD	0.48	0.60	*t*(3,884) = 16.31	<.001
CGAS	+0.58 SD	0.52	0.64	*t*(4,288) = 18.45	<.001
SDQ	+0.42 SD	0.31	0.53	*t*(2,529) = 6.27	<.001
Middle to end					
HoNOSCA	+0.34 SD	0.26	0.40	*t*(3,205) = 10.84	<.001
CGAS	+0.45 SD	0.38	0.52	*t*(3,753) = 13.61	<.001
SDQ	+0.36 SD	0.21	0.51	*t*(779) = 4.69	<.001
Start to end					
HoNOSCA	+0.86 SD	0.80	0.92	*t*(4,715) = 30.25	<.001
CGAS	+1.01 SD	0.94	1.08	*t*(4,903) = 25.50	<.001
SDQ	+0.68 SD	0.57	0.79	*t*(2,660) = 13.12	<.001

Abbreviations: CGAS, Children's Global Assessment Scale; CI, Confidence Interval; HoNOSCA, Health of the Nation Outcome Scales Child and Adolescent Mental Health; LL, Lower Limit; SD, Standard Deviations; SDQ, Strengths and Difficulties Questionnaire; *t(df)*, T-test score with degree of freedom; UL, Upper Limit.

Not all children improved. Based on the reliable change index (RCI) (Parabiaghi et al., 2005), 26.5%, and 20.6% showed reliable improvement while 1.8% and 1.3% deteriorated on respectively the HoNOSCA and Total SDQ score. The rest remained stable. Moreover, the average scores on both the CGAS and HoNOSCA remained in the clinical ranges at the end of the treatment (Garralda et al., 2000; Wagner et al., 2007). The average total SDQ score, as well as EPS, CPS and PPS subscores, were also still in the slightly raised band (AMHOCN, 2003). Only HAS fell within the average band at the end of treatment. This is also reflected in the proportion of about 50% of
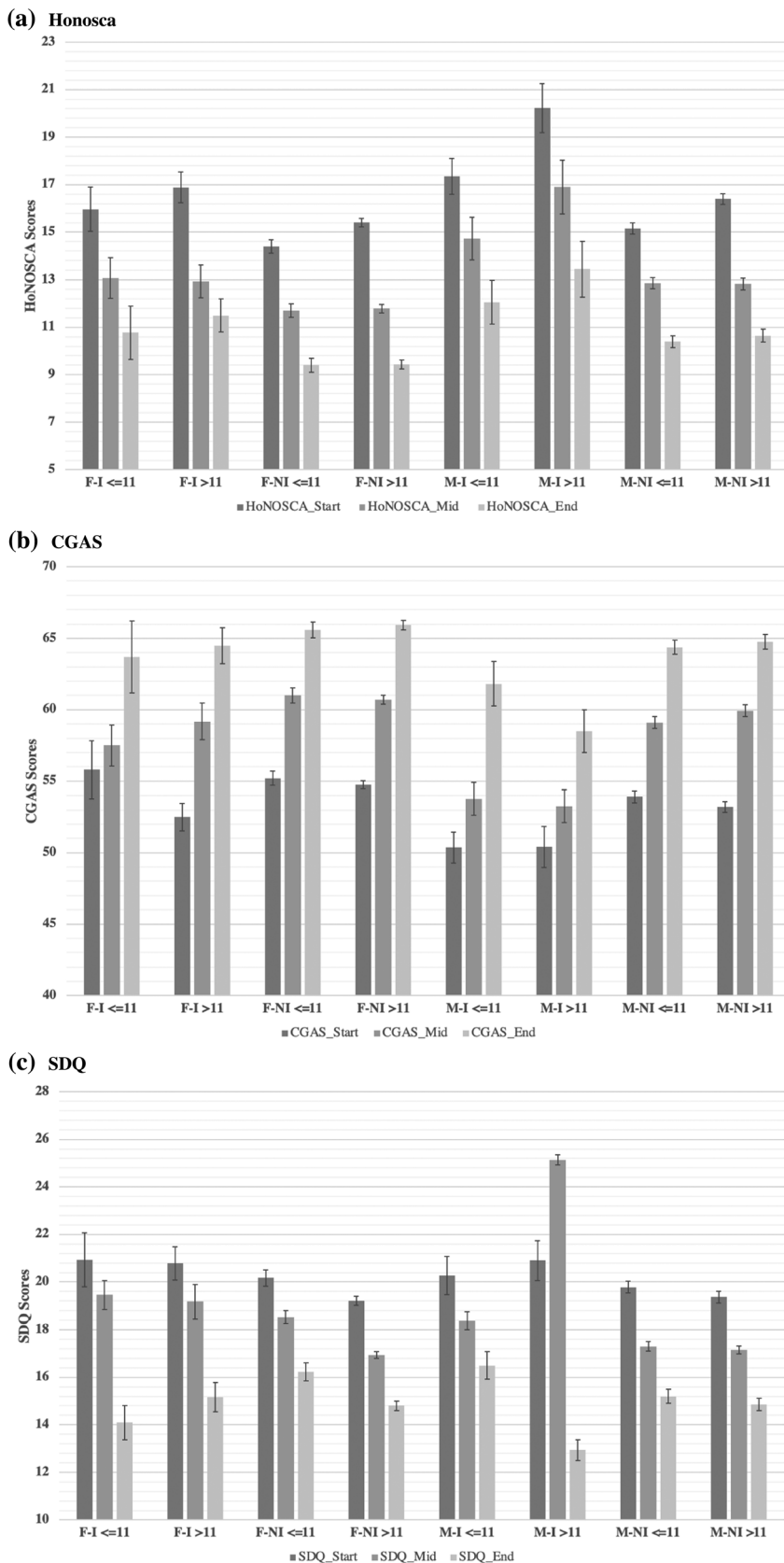
(a) Honosca

(b) CGAS

(c) SDQ

FIGURE 1 Improvement in ROM scores across gender, age, and ancestry background. (a) Honosca. (b) CGAS. (c) SDQ. ≤11 years of age; and >11 years of age. Bars representing standard errors. End, end score; F, female; I, indigenous; M, male; Mid, middle score; NI, non-indigenous; Start, start score

children still having ROM scores in the clinical range at the end of treatment (Table 4).

Given the wide variety in treatment duration and the high proportion of children still scoring in the clinical range at the end of

treatment, we post-hoc tested whether there was an association between treatment duration and outcomes. The aim was to explore whether a longer length of treatment was related to better outcomes. Table 6 shows the ROM scores divided between the four different

TABLE 6 Start and end ROM scores (SD) for children and adolescents with a treatment duration <91 days, >90 days and <181 days, >180 days and <366 days, and >365 days

	<91 days	>90 days and <181 days	>180 days and <366 days	>365 days	F	p
HoNOSCA-Start	15.2 (6.1)	15.5 (6.1)	15.8 (6.0)	15.9 (5.9)	1.82	.148
HoNOSCA-End	10.7 (7.0)	10.2 (6.9)	9.9 (6.4)	9.2 (6.1)	2.92	.033
CGAS-Start	54.8 (9.8)	54.6 (9.8)	53.6 (9.5)	53.2 (8.9)	3.99	.008
CGAS-End	63.4 (12.2)	64.5 (12.5)	65.7 (11.6)	67.0 (11.6)	6.81	<.001
SDQ-Start	19.4 (6.9)	20.0 (7.2)	20.2 (6.6)	20.4 (6.9)	1.79	.142
SDQ-End	16.2 (7.9)	16.0 (6.6)	15.0 (6.6)	14.4 (6.4)	1.56	.198

treatment duration groups: less than 3 months, between 3 and 6 months, between 6 months and a year, and over 1 year. These exploratory analyses showed a significant ($p < .001$) and nearly significant effect ($p < .05$) of treatment duration on outcome for the CGAS and the HoNOSCA with Cohen's d effect sizes of .30 and .23, respectively. The effect on the SDQ did not reach significance. This was due to the smaller sample size as the effect size was similar, that is, .25. These effect sizes indicated a small effect of treatment duration on outcome (Cohen, 1988).

3.4 | Comparison of child scores whose parents did or did not complete the end SDQ

As the low completion rates among parents may be related to participation bias, we analysed whether children with parents who completed the SDQ at the end differed from the children whose parents did not complete the SDQ. Children whose parents completed the SDQ had significantly better initial HoNOSCA ($M = 14.6$ (SD $= 5.5$) vs. $M = 15.8$ (SD $= 6.1$), $t(2,696) = 5.20$, $p < .001$) and CGAS scores ($M = 55.5$ (SD $= 9.5$) vs. $M = 53.8$ (SD $= 9.6$), $t(2,718) = 4.32$, $p < .001$) compared to those whose parents did not. There were also significant differences for the clinician rated end HoNOSCA ($M = 7.8$ (SD $= 5.7$) vs. $M = 10.7$ (SD $= 6.7$), $t(2,017) = 5.83$, $p < .001$) and end CGAS ($M = 70.0$ (SD $= 11.4$) vs. $M = 63.8$ (SD $= 12.0$), $t(2,183) = 4.36$, $p < .001$) in favour of those children whose parents completed the end SDQ. Duration of treatment was significantly longer for the children whose parents completed the end SDQ ($M = 255$ days (SD $= 182$) compared to $M = 217$ (SD $= 179$), $t(3,096) = 3.49$, $p < .001$). There was no significant difference between numbers of episodes ($t(3,096) = 0.57$, $p = .28$). Lastly, families with an end SDQ also lived in socioeconomic more advantaged areas as reflected by an index core of 1033 ± 49 (69th percentile) compared to 1014 ± 64 (61th percentile) with $t(3,096) = 8.10$, $p < .001$.

4 | DISCUSSION

We performed a largescale study describing the sociodemographic and clinical characteristics as well as treatment outcomes of 3098 children between 5 and 18 years of age, who were treated in

Australian community mental health settings, that are public funded free services specialized in treating complex and severe mental health issues. This was confirmed by the data: many of the children and adolescents had experienced adverse events, indicated by the high rates of Z-codes and the comorbidity rate of 42% was high compared to the 30% comorbidity rate observed in the general population of children with mental disorders (Lawrence et al., 2015).

Considering treatment outcomes, ROM scores showed substantial improvement, with Cohen's d effect sizes in the medium (0.7 for parental SDQ) and large range (0.9 and 1.0 HoNOSCA and CGAS) (Cohen, 1988) which are comparable to previously reported effect sizes between 0.5 and 1 (Brann & Coleman, 2010; Lundh et al., 2013; Murphy et al., 2015; Wolpert et al., 2016). Proportions of children that reliably improved or deteriorated were ~20% and ~1% respectively in the current study. These estimates were higher in two of the previous studies, ~50% and ~11%, (Murphy et al., 2015; Wolpert et al., 2016) but comparable to another study who also used the HoNOSCA and reported rates of 28.5% and 1% (Brann & Coleman, 2010). The difference with the other two studies is explained by a higher reliability of the outcome measures used. Despite the large improvement for all scales, especially when considering the effect sizes, the average scores at the end of treatment were generally still in the subclinical range and the rates of children still scoring in the clinical range varied between 43% and 57%. This indicates that a high proportion of children still has residual symptoms. The outcomes did not significantly differ between gender, or between those who identified as Indigenous or non-Indigenous.

The residual symptoms that are reported at the end of treatment are a significant risk for persistence/relapse.

As in around 50% of the children the treatment episode was shorter than 6 months, the question is whether treatments should be longer. There was some effect of treatment duration on the outcomes, but the effect sizes were small (between .23 and .30) and did only reach significance for the cGAS. These results however do not necessarily imply that increasing treatment length could not result in larger effect sizes for part of the CYMHS population. As the differences in outcomes across the treatment durations are not large, this suggests that a certain level of residual symptoms is tolerated in all groups. We can only speculate why treatments in CYMHS are not continued despite children still experiencing symptoms, even if the treatment has only been relatively short. One contributing factor

might be that the volume of referrals of acute high-risk cases is very high for community CYMHS resulting in pressure to discharge children once the acute high-risk has decreased. Possibly, children who are still experiencing symptoms are referred to other services that provide treatment to young people with lower levels of mental health problems. However, even if that is the case, transitioning between services increases the risk of dropout, and hence the risk for persistence or relapse. Another reason could be that families or children drop out when symptoms have improved as they think that this is "as good as it gets". Research providing insight into these mechanisms is the next step. Still, services should aim to provide care till full remission is achieved.

Eight percent of the children accessing the service were of Aboriginal and/or Torres Strait Islander origin. This is twice the percentage of aboriginal and Torres Strait Islander people living in Queensland (Queensland Government Statistician's Office, 2016). It was to be expected that Indigenous children would be relatively over-represented. The rates of completed suicides in the Aboriginal and Torres Strait Islander people is higher compared to non-indigenous children (Soole et al., 2014) and the Longitudinal Study of Indigenous children observed higher SDQ scores compared to non-indigenous children (Department of Social Services, 2015). It is encouraging that their treatment outcomes did not differ from non-Indigenous children and adolescents, but more focused research is necessary to indicate whether their needs are met by current CYMHS.

4.1 | Limitations

The most important limitation of this study is the low response rates at the later time points, in particular for the parental rates, The rates were comparable to an earlier study about the implementation of ROM in Australia with high completion rates at the start, reasonable clinician completion rates in the middle and the end, but fairly low rates of parent completed SDQs in the middle and at the end (Burgess et al., 2015). As children whose parents did complete the end-SDQ had significantly better clinician reported end-ROM and longer duration of treatment, there may be participation bias, that influenced the parental outcomes. However, the consistency in the patterns of the results in the parental versus the clinician scores suggest that, although the parental end scores may be slightly inflated, there is substantial improvement over time. Another limitation is that data on interrater-reliability were lacking as well as data on number of appointments. The latter would be helpful in getting better insight into the association between treatment intensity and outcomes.

5 | CONCLUSION

Children accessing community CYMHS have severe and complex mental disorders that respond well to treatment, but ROM scores remain in the subclinical range on discharge. As this consists a risk for persistence or relapse of symptoms, it is important to get more insight

on the reasons for these early discharges and investigate how to optimize treatment so that children achieve full remission if possible.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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APPENDIX: CHARACTERISTICS AND TREATMENT OUTCOME OF CHILDREN AND ADOLESCENTS REFERRED TO CHILD AND YOUTH MENTAL HEALTH SERVICES (CYMHS) IN AUSTRALIA: A NATURALISTIC STUDY

TABLE A1 Detailed list of proportion of children/adolescents with F-code psychiatric diagnoses

Psychiatric diagnoses	% Diagnosed (N = 3098)
Anxiety disorders	36.7%
1) Generalized anxiety disorder	8.9%
F41.1	
2) Phobic anxiety disorders	7.4%
F40.0/40.1/40.2/40.8/40.9/93.1/93.2	
3) Separation anxiety disorder	3.2%
F93.0	
4) Panic disorder	1.2%
F41.0	
5) Other anxiety disorders	21.3%
F41.2/41.3/41.8/41.9	
Mood disorders	19.0%
F30.0/30.1/30.1/30.8/30.9/31.0–31.9/32.0/32.1/32.3/32.8/32.9	
Stress disorders	15.5%
F43.0/43.1/43.9	
Adjustment disorder	14.3%
F43.2	
Developmental disorders	10.3%
F80.0/80.1/80.2/80.3/80.8/80.9/81.0/81.1/81.2/81.3/81.8/81.9/82.0/83.0/88.0/89.0	
Attention deficit hyperactivity disorders	10.3%
F90.0/90.1/90.8/90.9	
Emotional and social disorders onset children/adolescent	9.3%
F93.3/93.8/93.9/94.0/94.1/94.2/94.8/94.9	
Other behavioural and emotional disorders	4.6%
F98.0–98.9/99.0	
Conduct disorders	3.6%
F91.0/91.1/91.2/91.3/91.8/91.1	
Mixed disorders of conduct and emotions	3.5%
F92.0/92.8/92.9	
Other psychiatric diagnoses	15.0%
1) Eating disorders	3.8%
F50.0/50.1/50.2/50.3/50.4/50.5/50.8/50.9	
2) Disorders due to substance use	2.8%
F10.0–10.9/F11.0–11.9	
3) Obsessive–compulsive disorders	2.7%
F42.0/42.1/42.2/42.8/42.9	
4) Intellectual disabilities	1.7%
F79.0/70.0/70.1/70.8/70.9/71.1/71.8/71.9/79.8/72.0/72.1/72.8/72.9/79.9/73.0/73.1/73.8/73.9/78.0/78.1/78.8/78.9	
5) Nonorganic sleep disorders	0.8%
F51.0/51.1/51.2/51.3/51.4/51.5/51.8/51.9	
6) All other F codes	3.9%

Note: Diagnoses are not mutually exclusive.