

1 Social determinants of health, the family, and children's personal hygiene: a comparative study.

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24 **Abstract**

25 Aims

26 To examine differences in personal hygiene and in the perception of social rejection between
27 children in reception centers and children living in a family setting.

28 Background

29 Little attention has been paid to the influence of the family as a unit on the personal hygiene
30 behaviors of children.

31 Design

32 Cross-sectional study.

33 Methods

34 Children aged between 7-12 years were recruited from 2015 through 2017 from two centers in
35 the Network of State Care Centers and from three schools selected from a rural, suburban and
36 urban setting in the same region. A validated questionnaire on child personal hygiene habits
37 was completed by 51 children in reception centers and 454 in normal families.

38 Results

39 Data shows worse results for the majority personal hygiene habits studied in children in
40 reception centers than in children living in families. Multiple logistic regressions showed lower
41 frequency of body washing, hand washing after defecating, use of soap in hand washing, tooth
42 brushing, and dentist visits during the previous year. Also, a significantly higher proportion of
43 children in reception centers had experienced social rejection for being dirty and smelling bad
44 in comparison to the children living in families.

45 Conclusions

46 Deficient hygiene habits were observed in the offspring of families affected by the main
47 features of social inequality, who were more likely to perceive social rejection for this reason
48 and less likely to consider their family as the greatest influence on their personal hygiene

49 practices. Promoting family practices designed to improve personal hygiene habits are needed
50 specially in vulnerable families.

51

52 **Introduction**

53 Inequalities in health and wellbeing among social groups have been largely attributed
54 to social determinants of health (SDHs), which are considered at least as important as biological
55 mechanisms for disease prevention and treatment [1]. SDHs include socioeconomic and
56 political settings and the particular socioeconomic status of individuals; intermediate
57 determinants of SDHs include material resources, psychosocial, behavioral, and biological
58 factors, and healthcare systems [1].

59 Multilevel ecological models of SDHs include the family within the “social, family,
60 and community networks” domain, considered not only as a source of support and sustenance
61 but also as an educational resource for the acquisition of healthy habits. Negative aspects are
62 also recognized, with family conflict being a possible risk factor [2]. The family is the first and
63 most important influence on the health and development of children and on the shaping of their
64 routines, habits, attitudes, and social behaviors, including personal hygiene habits [3–5]

65 **Background**

66 Improvements in sanitary conditions and the acquisition of certain personal hygiene
67 practices during childhood have played a decisive role in reducing infant mortality and
68 increasing life expectancy [6]. However, diseases related to poor hygiene (e.g., diarrhea or
69 respiratory infections) still kill millions of infants in countries with the greatest social
70 inequalities [7–9]. Inadequate hygiene practices have also been implicated in infant morbidity
71 in developed countries, including infectious and parasitic diseases, pneumonia [8], otitis,
72 mycosis, diarrhea, dental caries, gingivitis, and pediculosis [10,11]. Poor hygiene can also be
73 a cause of social rejection, especially for children from poorer families [12].

74 An inadequate family income is considered as a primary cause of poor health in
75 children [13,14], but the role of the family as social determinant has not been sufficiently
76 considered, although SDH-related factors are known to affect the capacity of families to care
77 for their children [15]. However, researchers have often analyzed the family in a fragmented
78 manner rather than as a unit. For instance, it has been investigated whether the wealth of
79 families and relationships with parents predict healthy behaviors in young people [16] or
80 whether parental educational level is associated with personal hygiene habits [17].

81 Over recent years, the risk of family poverty has been increased by economic
82 recession, family breakups, and migration, among other factors [18]. Economic inequalities
83 and the lack of effective social policies have also affected the most vulnerable, generating
84 unstructured and dysfunctional families [19]. In extreme cases, such as abuse or abandonment,
85 the state can move children into reception centers for their protection and safety [20]. Children
86 in reception centers (CRCs) have been described as invisible [21], and there has been little
87 research on their health-related lifestyles.

88 Analysis of the influence of the family as SDH involves the identification of health or
89 healthcare disparity between vulnerable and less-vulnerable populations [22]. The aim of this
90 study was to determine whether CRCs and children living in families (CLFs) differ in their
91 personal hygiene habits and learning and in their perception of social rejection.

92 **Material and methods**

93 An observational, cross-sectional study compared a group of CRCs with a group of
94 CLFs was carried out.

95 **Setting and Participants**

96 Children aged between 7 and 12 yrs were studied from March 2015 through January
97 2017. CRCs were recruited from two centers in the Network of State Care Centers (first stage
98 in fostering process). CLFs were recruited from three schools selected by convenience from a

99 rural (<30,000 inhabitants), suburban (30,000 – 50,000 inhabitants), and urban (>50,000
100 inhabitants) setting in the same region.

101 The eligible population was all children in the selected schools and reception centers
102 who met the following inclusion criteria: age between 7 and 12 yrs, voluntary participation,
103 and written consent to participation from parents or legal guardians. Exclusion criteria were
104 inability to speak Spanish or the presence of physical/psychological disabilities that hindered
105 participation. CRCs who had previously been admitted to care were also excluded to avoid the
106 influence of hygiene habits acquired during earlier admission(s).

107 **Data collection**

108 **Parents/guardians questionnaire**

109 A questionnaire was administered to parents/guardians of the CLFs to gather data on
110 their educational level, current occupation, type of employment, and household monthly
111 income. CLFs were divided into three groups according to this income: $\leq 1,000$ €, 1,001 -
112 2,000€, and $> 2,000$ €. Information was also collected on the sex, age, and nationality of the
113 children, the nationality of the parents, number of siblings, and days of school attendance per
114 week.

115 **Children Personal Hygiene Questionnaire (HICORIN®)**

116 Children data were gathered using the HICORIN® questionnaire, which includes 63
117 items divided among seven personal hygiene dimensions and hygiene-related social aspects.
118 For this study, we selected items related to the frequency, manner, and timing of personal
119 hygiene activities and the materials used, considering the following dimensions: body skin (8
120 items), hair (2 items), hands (5 items), oral (14 items); agents affecting personal hygiene
121 learning (8 items); social rejection (2 items); and motivation for personal hygiene activities (5
122 items).

123 The HICORIN® questionnaire was interviewer-administered for children aged 7-10 yrs
124 and self-administered for those aged 11-12 yrs. It was completed by participating CLFs at
125 school one week after consent to participation was obtained from parents/guardians and by
126 participating CRCs within two days of admission to the care center. Economic data for the
127 parents/guardians of CRCs were gathered from the computer records of the protection centers.

128 **Ethical considerations**

129 The study was approved by the Research Ethics Committee of the University of
130 Murcia (22012014). Written authorization for the children's participation was obtained from
131 parents/guardians in the case of CLFs and from the General Directorate of Social Policy of
132 Murcia Autonomous Community in the case of CRCs.

133 **Data analysis**

134 Exploratory analysis was carried out to evaluate missing data and questionnaires with
135 missing items were eliminated. In a descriptive analysis, we calculated absolute and relative
136 frequencies for qualitative variables and means with standard deviation (SD) for quantitative
137 variables. We used the chi-square test to assess differences in the personal hygiene habits
138 between CRCs and CLFs, stratifying CLFs families into three income levels. We performed
139 multivariate binomial logistic regression analysis to compare the prevalence of hygiene habits
140 between CRCs and CLFs, calculating crude odds ratios (ORs) and ORs adjusted for sex and
141 age with 95 % confidence interval (95% CI). IBM SPSS 21.0 (IBM SPSS, Chicago, IL, USA)
142 was used for the data analysis, considering $p < 0.05$ to be statistically significant.

143 **Validity, Reliability and Rigour**

144 HICORIN® questionnaire has been validated for Spanish populations and can be used
145 in healthy children to prevent diseases that might not happen (Moreno-Martínez, Ruzafa-
146 Martínez, Ramos-Morcillo, Gómez García, & Hernández-Susarte, 2015). It has demonstrated

147 adequate reliability; the results of the test-retest coefficient were between very good and
 148 moderate in 84.1% of the items. Likewise, content validation, pilot study and items response
 149 analysis confirmed satisfactory validity.

150

151 **Results**

152 Study eligibility criteria were met by 51 out of the 563 children admitted to the two
 153 reception centers during the study period, and all completed the questionnaire (100% response
 154 rate). These criteria were met by 758 CLFs in the three schools, and 404 of them completed
 155 the questionnaire (53.29% response rate).

156 **Sociodemographic characteristics of families and children**

157 Comparison of the characteristics of the families of the four study groups (CRCs and
 158 three groups of CLFs by monthly household income) revealed significant differences in all
 159 study variables (Table 1). In families of CRCs, 90.2% (n=46) of parents had no or only primary
 160 schooling, 48% (n=24) were employed (50% of these in unskilled work), and 88.2% (45) of
 161 the families had a monthly household income \leq 1,000€. A significantly higher percentage of
 162 CRCs (21 %, n=11) were immigrants in comparison to the three groups of CLFs, 41.2% (n=21)
 163 had immigrant mothers and 33% (n=17) had immigrant fathers, 70.6% (n=36) had \geq 3 siblings,
 164 and 31.4% (n=16) reported not going to school every day.

165 **Table 1. Comparison of family socioeconomic variables between children in residential**
 166 **care and those living with their family according to its monthly income (N=455)**

Family socioeconomic variables		CRC n=51	CLF Income \leq 1000€ n=82	CLF Income 1001€-2000€ n=97	CLF Income >2000€ n=225
Parents Educational level***					
	No or primary studies n(%)	46(90.2)	37(45.7)	18(17.6)	0(0.0)
	First stage of secondary schooling or mid-level vocational training n(%)	3(5.9)	8(9.9)	9(8.8)	4(1.8)

	Second stage of secondary education or higher-level vocational training n(%)	2(3.9)	27(33.3)	34(33.3)	16(7.1)
	University studies n(%)	0(0.0)	9(11.1)	41(40.2)	204(91.1)
Parents Current occupation***					
	Student, exclusive dedication n(%)	0(0.0)	4(4.8)	0(0.0)	0(0.0)
	Self-employed n(%)	2(4.0)	7(8.4)	14(13.7)	54(24.1)
	Employed n(%)	20(40.0)	34(41.0)	54(52.9)	143(63.8)
	Retired n(%)	0(0.0)	0(0.0)	1(1.0)	2(0.9)
	Unemployed n(%)	26(52.0)	36(43.4)	27(26.5)	21(9.4)
	Other n(%)	2(4.0)	2(2.4)	6(5.9)	4(1.8)
Type of employment***					
	Manager/director in public administration or and companies with ≥10 workers n(%)	0(0.0)	0(0.0)	3(4.3)	93(47.2)
	Manager in companies with <10 workers n(%)	0(0.0)	0(0.0)	9(13.0)	30(15.2)
	Administrative workers. Personnel services & safety n(%)	2(9.1)	7(17.9)	23(33.3)	44(22.3)
	Self-employed n(%)	1(4.5)	9(23.1)	14(20.3)	24(12.2)
	Supervisors of manual workers n(%)	0(0.0)	0(0.0)	1(1.4)	0(0.0)
	Qualified and semi-qualified manual workers n(%)	8(36.4)	14(35.9)	15(21.7)	5(2.5)
	Unqualified workers n(%)	11(50.0)	9(23.1)	4(5.8)	1(0.5)
Children Sex	Male n(%)	24(47.1)	39(46.4)	47(47.5)	122(54.2)
	Female n(%)	27(52.9)	45(53.6)	52(52.5)	103(45.8)
Children Age*	7-8 yrs n(%)	13(26.0)	30(35.7)	37(36.6)	92(40.9)
	9-10 yrs n(%)	15(30.0)	36(42.9)	43(42.6)	83(36.9)
	11-12 yrs n(%)	22(44.0)	18(21.4)	21(20.8)	50(22.2)
Children Place of birth **	Spain n(%)	40(78.4)	72(84.7)	99(97.1)	221(98.2)
	Another country n(%)	11(21.6)	10(11.8)	2(2.0)	4(1.8)
	Unknown n(%)	0(0.0)	3(3.5)	1(1.0)	0(0.0)
Place of birth of mother**	Spain n(%)	30(58.8)	59(70.2)	94(92.2)	213(94.7)
	Another country n(%)	21(41.2)	19(22.6)	5(4.9)	7(3.1)
	Unknown n(%)	0(0.0)	6(7.1)	3(2.9)	5(2.2)
Place of birth of father**	Spain n(%)	33(64.7)	59(71.1)	91(89.2)	211(93.8)
	Another country n(%)	17(33.3)	19(22.9)	7(6.9)	4(1.8)
	Unknown n(%)	1(2.0)	5(6.0)	4(3.9)	10(4.4)
Number of siblings**	None n(%)	2(3.9)	6(7.1)	6(5.9)	13(5.8)
	1 or 2 n(%)	13(25.5)	65(76.5)	82(80.4)	188(83.6)
	3 or more n(%)	36(70.6)	14(16.5)	14(13.7)	24(10.7)
School attendance **	Always n(%)	35(68.6)	82(98.8)	101(100)	224(99.6)
	3 or 4 days a week n(%)	5(9.8)	1(1.2)	0(0.0)	0(0.0)
	1 or 2 days a week n(%)	4(7.8)	0(0.0)	0(0.0)	1(0.4)
	Never n(%)	7(13.7)	0(0.0)	0(0.0)	0(0.0)

167 CRC: Children in residential care; CLF: children living in a family

168 *p<0.05; **p=0.001; *** p<0.0001

169 Personal hygiene habits

170 Tables 2 exhibits the results for body and hair hygiene habits. Statistically significant
 171 differences were found between CRCs and CLFs in almost all items. The frequency of body
 172 washing “ ≥ 3 days a week” was 12- to 15-fold lower in CRCs than in CLFs; a wet towel/sponge
 173 was used for body washing by 23.5% (n=12) of CRCs *versus* almost 100% of CLFs who
 174 reported taking a shower/bath; and body washing was performed at night (before bedtime) by
 175 39.2% (n=20) of CRCs *versus* <50 % of CLFs. With regard to materials, gels were not used or
 176 known by 21.6% (n=11) of CRCs *versus* 3.6-7.1% of CLFs, the use of bars of soap was
 177 uncommon but was more frequent by CRCs than by CLFs (n=17). A washbowl was more often
 178 used in body washing by CRCs than by CLFs, whose use of this complement was less frequent
 179 with higher household income. A hair washing frequency of “ ≥ 3 times/week” was 8.6-9.5-fold
 180 lower in CRCs than in the CLF groups. The frequency of shampoo use did not significantly
 181 differ between CRCs and CLFs (p=0.364).

182 **Table 2. Comparison of body/hair and hand hygiene variables between children in residential care and**
 183 **those living with their family according to its monthly income (N=455)**

Body washing		CRC n=51	CLF Income $\leq 1,000$ € n=82	CLF Income 1,001 €-2,000 € n=97	CLF Income >2,000 € n=225
Weekly frequency***	≥ 3 days n(%)	26 (51.0)	76 (89.4)	93 (92.1)	200 (90.5)
	≤ 2 days n(%)	25 (49.0)	9 (10.6)	8 (7.9)	21 (9.5)
	OR (95 % CI)***	1	8.1 (3.3-19.6)	11.1 (4.5-27.6)	9.1 (4.5-18.6)
	ORa (95 % CI)***	1	12.0 (4.6-31.3)	15.2 (5.7-40.0)	14.1 (6.3-31.4)
Manner of washing***	Shower/Bath n(%)	39 (76.5)	83 (98.8)	99 (99.0)	225 (100.0)
	Towel/sponge n(%)	12 (23.5)	1 (1.2)	1 (1.0)	0 (0.0)
	OR (95 % CI)***	1	25.5 (3.2-203.4)	30.4 (3.8-242.2)	^a
	ORa (95 % CI)***	1	33.2 (4.0-273.2)	^a	^a
Time of day	Bedtime n(%)	20 (39.2)	38 (45.2)	59 (57.8)	125 (56.1)
	Other n(%)	31 (60.8)	46 (54.8)	43 (42.2)	98 (43.9)
	OR (95 % CI)	1	1.2 (0.6-2.5)	2.1 (1.0-4.2)	1.9 (1.0-3.6)
	ORa (95 % CI)	1	1.4 (0.6-2.9)	2.2 (1.1-4.6)	2.2 (1.1-4.2)
Use shower gel***	Yes n(%)	40 (78.4)	79 (92.9)	98 (96.1)	217 (96.4)
	No/unknown n(%)	11 (21.6)	6 (7.1)	4 (3.9)	8 (3.6)
	OR (95 % CI)**	1	3.6 (1.2-10.5)	6.7 (2.9-22.4)	7.4 (2.8-19.7)
	ORa (95 % CI)***	1	4.6 (1.5-14.1)	10.8 (2.8-42.1)	10.2 (3.6-28.2)
Use sponge**	No/unknown n(%)	15 (29.4)	14 (16.9)	25 (24.8)	84 (37.5)
	Yes n(%)	36 (70.6)	69 (83.1)	76 (75.2)	140 (62.5)
	OR (95 % CI)**	1	0.4 (0.2-1.1)	0.7 (0.3-1.6)	1.4 (0.7-2.7)
	ORa (95 % CI)**	1	0.4 (0.1-1.0)	0.8 (0.3-1.7)	1.3 (0.7-2.6)
Use bar of	No/unknown n(%)	34 (66.7)	60 (74.1)	84 (84.0)	189 (85.5)

soap**	Yes n(%)	17 (33.3)	21 (25.9)	16 (16.0)	32 (14.5)
	OR (95 % CI)**	1	1.4 (0.6-3.0)	2.6 (1.1-5.7)	2.9 (1.4-5.9)
	ORa (95 % CI)**	1	1.3 (0.6-2.9)	2.7 (1.2-6.0)	2.9 (1.4-5.9)
Use washbowl	No/unknown n(%)	38 (74.5)	76 (90.5)	97 (96.0)	219 (98.2)
	Yes n(%)	13 (25.5)	8 (9.5)	4 (4.0)	4 (1.8)
	OR (95 % CI)***	1	3.2 (1.2-8.5)	8.2 (2.5-27.0)	18.7 (5.7-60.4)
	ORa (95 % CI)***	1	3.9 (1.4-10.7)	12.8 (3.3-48.5)	23.9 (7.1-79.9)
Weekly frequency of hair washing***	≥3 days n(%)	21 (41.2)	68 (80.0)	81 (80.2)	177 (80.1)
	≤2 days n(%)	30 (58.8)	17 (20.0)	20 (19.8)	44 (19.9)
	OR (95 % CI)***	1	5.7 (2.6-12.3)	5.7 (2.7-12.1)	5.7 (3.0-10.9)
	ORa (95 % CI)***	1	9.5 (4.0-22.4)	8.6 (3.8-19.6)	9.4 (4.4-19.6)
Use shampoo	Yes n(%)	48 (94.1)	80 (96.4)	100 (98.0)	217 (98.2)
	No/unknown n(%)	3 (5.9)	3 (3.6)	2 (2.0)	4 (1.8)
	OR (95 % CI)	1	1.6 (0.3-8.5)	3.1 (0.5-19.3)	3.3 (0.7-15.6)
	ORa (95 % CI)	1	1.6 (0.3-8.9)	3.1 (0.4-19.4)	3.7 (0.7-17.7)

184 CRC: Children in residential care; CLF: children living on a family; OR: Odds Ratio; ORa: Odds Ratio adjusted
 185 for age and sex; ^aOR calculation not applicable

186 *p<0.05; **p<0.01; ***p<0.001

187

188 As shown in Table 3 “hand washing ≥3times a day” was reported by a lower
 189 percentage of CRCs than of CLFs, regardless of their household income, but the difference was
 190 not statistically significant. The use of soap in hand washing was significantly less frequent
 191 among CRCs (39.2%; 20) than among CLFs in the income group between 1,001 and 2,000€
 192 (89.2%; 91). Statistically significant differences were also obtained in hand washing
 193 frequencies, which were always lower for CRCs. Hand washing after defecating was the most
 194 frequent practice in all study groups, although it was reported by a higher percentage of CLFs
 195 than CRCs.

196 **Table 3. Comparison of hand hygiene variables between children in residential care and**
 197 **those living with their family according to its monthly income (N=455)**

Hand washing		CRC n=51	CLF Income ≤1,000 € n=83	CLF Income 1,001 €-2,000 € n=97	CLF Income >2,000 € n=224
Daily frequency	>3 times n(%)	13 (25.5)	31 (36.5)	35 (35.0)	80 (35.7%)
	≤3 times n(%)	38 (74.5)	54 (63.5)	65 (65.0)	144 (64.3)
	OR (95 % CI)	1	1.6 (0.7-3.6)	1.5 (0.7-3.3)	1.6 (0.8-3.2)
	ORa (95 % CI)	1	2.0 (0.9-4.4)	1.7 (0.8-3.8)	1.9 (0.9-3.9)
Always before every meal*	Yes n(%)	5 (9.8)	47 (55.3)	53 (52.0)	116 (51.6)
	No n(%)	46 (90.2)	38 (44.7)	49 (48.0)	109 (48.4)
	OR (95 % CI)*	1	11.3 (4.1-31.4)	9.9 (3.6-27.0)	9.7 (3.7-25.5)
	ORa (95 % CI)*	1	12.0 (4.3-33.3)	9.9 (3.6-27.2)	9.7 (3.7-25.5)
Always after	Yes n(%)	16 (31.4)	60 (70.6)	79 (77.5)	172 (77.1)

defecating*	No n(%)	35 (68.6)	25 (29.4)	23 (22.5)	51 (22.9)
	OR (95 % CI)*	1	5.2 (2.4-11.1)	7.5 (3.5-15.9)	7.3 (3.7-14.4)
	ORa (95 % CI)*	1	9.5 (4.1-22.1)	11.2 (4.9-25.6)	12.8 (6.0-27.5)
Always after urinating*	Yes n(%)	7 (13.7)	47 (55.3)	61 (59.8)	121 (53.8)
	No n(%)	44 (86.3)	38 (44.7)	41 (40.2)	104 (46.2)
	OR (95 % CI)*	1	7.7 (3.1-19.2)	9.3 (3.8-22.7)	7.3 (3.1-16.9)
	ORa (95 % CI)*	1	10.6 (4.1-27.4)	11.9 (4.7-30.2)	10.1 (4.2-24.3)
Always use soap*	Yes n(%)	20 (39.2)	63 (74.1)	91 (89.2)	181 (80.4)
	No n(%)	31 (60.8)	22 (25.9)	11 (10.8)	44 (19.6)
	OR (95 % CI)*	1	4.4 (2.1-9.3)	12.8 (5.5-29.7)	6.3 (3.3-12.2)
	ORa (95 % CI)*	1	4.5 (2.1-9.6)	13.6 (5.7-32.3)	6.3 (3.3-12.2)

198 CRC: children in residential care; CLF: Children living on a family; OR: Odds Ratio; ORa: Odds Ratio adjusted for age and
199 sex

200 *p<0.001

201

202 Statistically significant results were observed in all oral hygiene items (Table 4). The
203 tooth brushing frequency “ ≥ 2 times a day” was reported by a lower percentage of CRCs than
204 of CLFs, and the percentage of CLFs increased with higher household incomes. The highest
205 frequency of tooth brushing by all of the children was at night (before bedtime), although it
206 was significantly less frequent in CRCs. With respect to the materials used for oral hygiene,
207 toothbrush and toothpaste were the most frequently used (>80% in all groups). In addition,
208 17.6% (9) of CRCs shared their toothbrush with other family members. There were also
209 significant differences in the type of toothbrush used, with 6% of CRCs reporting the use of an
210 electrical toothbrush *versus* 40% of CLFs. Conversely, utilization of a toothpick was reported
211 by a higher percentage of CRCs than of CLFs (37.3%; 19). The frequency of dentist visits
212 during the previous year was significantly lower in CRCs and was greater with higher
213 household income in CLFs.

214 **Table 4. Comparison of oral hygiene variables between children in residential care and those living with**
215 **their family according to its monthly income (N=456)**

Oral hygiene		CRC n=51	CFL Income $\leq 1,000$ € n=83	CLF Income 1,001 €-2,000 € n=98	CLF Income >2,000 € n=224
Daily tooth brushing frequency**	≥ 2 times n(%)	17 (33.3)	57 (67.1)	75 (73.5)	184 (82.1)
	<2times n(%)	34 (66.7)	28 (32.9)	27 (26.5)	40 (17.9)
	OR (95 % CI)**	1	4.0 (1.9-8.5)	5.5 (2.6-11.5)	9.2 (4.6-18.0)

	ORa (95 % CI)**	1	4.9 (2.2-10.6)	6.4 (2.9-13.7)	11.8 (5.7-24.3)
Dentist visits during previous year**	Yes n(%)	17 (34.0)	68 (82.9)	90 (90.9)	203 (91.4)
	No n(%)	33 (66.0)	14 (17.1)	9 (9.1)	19 (8.6)
	OR (95 % CI)**	1	9.4 (4.1-21.4)	19.4 (7.8-47.7)	20.7 (9.7-43.9)
	ORa (95 % CI)**	1	10.0 (4.3-23.0)	18.5 (7.5-45.7)	20.7 (9.7-43.9)
Brush when getting up in the morning**	Yes n(%)	9 (17.6)	53 (62.4)	55 (54.5)	108 (48.0)
	No n(%)	42 (82.4)	32 (37.6)	46 (45.5)	117 (52.0)
	OR (95 % CI)**	1	7.7 (3.3-17.9)	5.5 (2.4-12.6)	4.3 (2.0-9.2)
	ORa (95 % CI)**	1	7.8 (3.3-18.2)	5.8 (2.5-13.3)	4.3 (2.0-9.2)
Brush after every main meal**	Yes n(%)	6 (11.8)	37 (44.6)	51 (51.0)	102 (45.3)
	No n(%)	45 (88.2)	46 (55.4)	49 (49.0)	123 (54.7)
	OR (95 % CI)**	1	6.0 (2.3-15.6)	7.8 (3.0-19.9)	6.2 (2.5-15.1)
	ORa (95 % CI)**	1	6.3 (2.4-16.4)	7.6 (2.9-19.6)	6.2 (2.5-15.1)
Wash before going to bed at night**	Yes n(%)	13 (25.5)	64 (77.1)	86 (85.1)	191 (85.7)
	No n(%)	38 (74.5)	19 (22.9)	15 (14.9)	32 (14.3)
	OR (95 % CI)**	1	9.8 (4.3-22.1)	16.7 (7.2-38.6)	17.4 (8.3-36.2)
	ORa (95 % CI)**	1	12.2 (5.1-28.8)	23.8 (9.6-58.4)	23.0 (10.4-50.9)
Use toothbrush**	Yes n(%)	41 (80.4)	84 (98.8)	102 (100.0)	223 (99.6)
	No/unknown n(%)	10 (19.6)	1 (1.2)	0 (0.0)	1 (0.4)
	OR (95 % CI)**	1	20.4 (2.5-165.5)	^a	54.3 (6.7-436.4)
	ORa (95 % CI)**	1	20.0 (2.4-161.6)	^a	54.3 (6.7-436.4)
Use toothpaste**	Yes n(%)	40 (78.4)	84 (98.8)	100 (98.0)	222 (99.1)
	No/unknown n(%)	11 (21.6)	1 (1.2)	2 (2.0)	2 (0.9)
	OR (95 % CI)**	1	23.1 (2.8-185.1)	13.7 (2.9-64.8)	30.5 (6.5-142.9)
	ORa (95 % CI)**	1	22.5 (2.8-180.8)	13.2 (2.7-62.2)	30.5 (6.5-142.9)
Use mouthwash	Yes n(%)	9 (17.6)	31 (36.5)	45 (44.6)	81 (36.5)
	No/unknown n(%)	42 (82.4)	54 (63.5)	56 (55.4)	141 (63.5)
	OR (95 % CI)*	1	2.6 (1.1-6.2)	3.7 (1.6-8.5)	2.6 (1.2-5.7)
	ORa (95 % CI)**	1	3.7 (1.5-9.0)	5.0 (2.1-11.9)	3.6 (1.6-8.1)
Use dental floss*	Yes n(%)	3 (5.9)	17 (20.0)	30 (29.4)	45 (20.4)
	No/unknown n(%)	48 (94.1)	68 (80.0)	72 (70.6)	176 (79.6)
	OR (95 % CI)*	1	4.0 (1.1-14.4)	6.6 (1.9-23.0)	4.0 (1.2-13.7)
	ORa (95 % CI)*	1	4.1 (1.1-14.8)	6.7 (1.9-23.3)	4.0 (1.2-13.7)
Use toothpick**	No/unknown n(%)	32 (62.7)	72 (84.7)	79 (77.5)	208 (93.7)
	Yes n(%)	19 (37.3)	13 (15.3)	23 (22.5)	14 (6.3)
	OR (95 % CI)**	1	3.2 (1.4-7.4)	2.0 (0.9-4.2)	8.8 (4.0-19.3)
	ORa (95 % CI)**	1	3.2 (1.4-7.4)	2.2 (1.0-4.6)	9.4 (4.2-20.8)
Type of toothbrush**	Electrical n(%)	3 (5.9)	33 (38.8)	42 (41.2)	93 (41.7)
	Manual n(%)	48 (94.1)	52 (61.2)	60 (58.8)	130 (58.3)
	OR (95 % CI)**	1	10.1 (2.9-35.2)	11.2 (3.2-38.3)	11.4 (3.4-37.8)
	ORa (95 % CI)**	1	10.5 (3.0-36.7)	11.0 (3.2-37.9)	11.4 (3.4-37.8)
Share toothbrush with others**	Yes n(%)	9 (17.6)	0 (0.0)	2 (2.0)	2 (0.9)
	No n(%)	42 (82.4)	81 (100.0)	97 (98.0)	221 (99.1)
	OR (95 % CI)**	1	^a	10.3 (2.1-50.1)	23.6 (4.9-113.5)
	ORa (95 % CI)**	1	^a	9.9 (2.0-48.1)	23.6 (4.9-113.5)
Tooth brushing duration**	1-3 min n(%)	17 (33.3)	60 (70.6)	68 (66.7)	152 (67.6)
	< 1 min n(%)	34 (66.7)	25 (29.4)	34 (33.3)	73 (32.4)
	OR (95 % CI)**	1	4.8 (2.2-10.1)	4.0 (1.9-8.1)	4.1 (2.1-7.9)

	ORa (95 % CI)**	1	6.6 (3.0-14.6)	5.0 (2.3-10.6)	5.3 (2.7-10.5)
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216 CRC: children in residential care; CLF: children living on a family; OR: Odds Ratio; ORa: Odds Ratio adjusted for age
217 and sex; ^a OR calculation not applicable

218 *p<0.01; **p<0.001

219

220 **Personal hygiene practice learning and social rejection**

221 The family (father, mother, or other family member) was most frequently described
222 by all groups of children as having the greatest influence on their personal hygiene learning,
223 although this affirmation was made by a significantly lower percentage of CRCs (72.5 %, 37)
224 than of CLFs. In second place as learning agents, CLFs selected healthcare professionals, while
225 CRCs selected teachers, radio, television, internet, and self-learning (Table 5).

226 A significantly higher proportion of CRCs (41.1 %) had experienced social rejection
227 for being dirty in comparison to the CLFs (9.5% of those with family incomes < 1.000€ and
228 around 4% of those with higher family incomes). Very similar differences were observed in
229 the experience of rejection for smelling bad, although the percentages were slightly higher in
230 all groups, reaching almost 50% in CRCs and between 8.9 and 10.7% in CLFs. The only
231 statistically significant difference in motivations for personal hygiene activities was in the
232 option “to not be rejected by friends”, which was selected by 90% of CRCs *versus* 58% of
233 CLFs from families with incomes < 1,000€ and 36% of those from families with higher
234 incomes.

235 **Table 5. Comparison of socio-educational variables between children in residential care**
236 **and those living with their family according to its monthly income (N=455)**

Socio-educational variables			CRC n=51	CFL Income ≤1,000€ n=82	CFL Income 1,001€-2,000€ n=97	CFL Income >2,000€ n=225
	Influences on body hygiene	Father, mother, or other relatives**	Yes n(%)	37(72.5)	79(92.9)	94(93.1)
No n(%)			14(27.5)	6(7.1)	7(6.9)	21(9.3)
Friends		Yes n(%)	2(3.9)	2(2.4)	1(1.0)	2(0.9)
		No n(%)	49(96.1)	81(97.6)	98(99.0)	222(99.1)
Neighbors		Yes n(%)	2(3.9)	3(3.6)	0(0.0)	2(0.9)

		No n(%)	49(96.1)	81(96.4)	99(100.0)	222(99.1)
	Radio, television, Internet*	Yes n(%)	7(13.7)	7(8.3)	3(3.1)	10(4.5)
		No n(%)	44(86.3)	77(91.7)	95(96.9)	214(95.5)
	Teachers	Yes n(%)	13(25.5)	9(10.7)	12(12.2)	33(14.7)
		No n(%)	38(74.5)	75(89.3)	86(87.8)	191(85.3)
	Nurses Physicians	Yes n(%)	13(25.5)	32(38.1)	33(33.0)	84(37.5)
		No n(%)	38(74.5)	52(61.9)	67(67.0)	140(62.5)
	Self-learning	Yes n(%)	11(21.6)	9(11.1)	11(11.1)	22(9.8)
		No n(%)	40(78.4)	72(88.9)	88(88.9)	202(90.2)
	Unknown	Yes n(%)	1(2.0)	5(6.8)	2(2.2)	6(2.7)
		No n(%)	50(98.0)	68(93.2)	87(97.8)	216(97.3)
Social rejection	Rejected for being dirty**	Never n(%)	30(58.8)	76(90.5)	98(96.1)	214(95.5)
		Occasionally n(%)	4(7.8)	7(8.3)	4(3.9)	10(4.5)
		Several times n(%)	17(33.3)	1(1.2)	0(0.0)	0(0.0)
	Rejected for smelling bad**	Never n(%)	26(51.0)	75(89.3)	93(91.2)	204(91.1)
		Occasionally n(%)	7(13.7)	8(9.5)	8(7.8)	19(8.5)
		Several times n(%)	18(35.3)	1(1.2)	1(1.0)	1(0.4)
Reasons for hygiene	To be healthy	Yes n(%)	46(90.2)	77(90.6)	87(87.0)	200(89.3)
		No n(%)	5(9.8)	8(9.4)	13(13.0)	24(10.7)
	To not smell bad	Yes n(%)	49(96.1)	78(91.8)	89(87.3)	208(93.3)
		No n(%)	2(3.9)	7(8.2)	13(12.7)	15(6.7)
	To not be rejected by friends**	Yes n(%)	46(90.2)	49(58.3)	36(36.0)	81(36.3)
		No n(%)	5(9.8)	35(41.7)	64(64.0)	142(63.7)
	To not be punished at home	Yes n(%)	17(33.3)	24(28.2)	24(24.0)	59(26.5)
		No n(%)	34(66.7)	61(71.8)	76(76.0)	164(73.5)
	To feel good	Yes n(%)	49(96.1)	81(95.3)	96(95.0)	211(94.2)
		No n(%)	2(3.9)	4(4.7)	5(5.0)	13(5.8)

237 CRC: children in residential care; CFL: children living in a family

238 *p<0.05; **p<0.001

239

240 Discussion

241 There has been little research in developed countries on SDHs related to family and
 242 personal hygiene in childhood, and this study therefore contributes important empirical data.
 243 The main finding was a clear relationship between the personal hygiene of the children and
 244 their family settings.

245 In this study, CLFs were compared with CRCs whose situation of vulnerability was
 246 sufficiently extreme to warrant removal from their families [23]. The parents/guardians of the
 247 CRCs exhibit the main axes of inequality [1], being characterized by a low schooling level,
 248 low qualifications, unemployment or only casual unskilled employment, and an income <

249 1,000€, with 70% having ≥ 3 children. Among the CRCs, 78.4% were born in Spain, although
250 around two out of five of their parents were immigrants, and almost one out of three children
251 did not go to school every day.

252 In comparison to the CLFs, the CRCs had poorer hygiene habits in all dimensions
253 studied, were less likely to consider their families as the most influential agent in learning
254 hygiene habits, and were more likely to experience social rejection due to their hygiene and to
255 be motivated by this rejection to carry out personal hygiene activities. These findings question
256 whether vulnerable families are adequately fulfilling their functions of protection, healthcare,
257 and socialization [22,24].

258 The lower frequency of key personal hygiene practices (body, hair hand washing and
259 tooth brushing) in the children from vulnerable families is consistent with reports that implicate
260 the family structure and low parental educational and socioeconomic level in poor health,
261 hygiene [25], and oral hygiene [26] behaviors in children. A strong relationship has been
262 reported between low level of healthy habits and worse children's health as perceived by their
263 mothers (OR=0.48 95% CI=0.42-0.56) [25]. Hence, the detection of signs of poor personal
264 hygiene practices in children may help professionals to anticipate situations of ill health.

265 As previously observed by [27], an association was found between lower family
266 income and worse hygiene practices, especially dental hygiene habits, with less frequent daily
267 tooth brushing, tooth brushing before bedtime, and visits to the dentist. Despite the offer of free
268 oral healthcare, visits to the dentist during the previous year were between 10- and 20.7-fold
269 less frequent for CRCs than for CLFs. Researchers have concluded that families with lesser
270 resources have a worse relationship with healthcare systems [28,29], which they engage with
271 to a lesser extent, in part due to the lack of recognition of health problems [30].

272 The relationship between the physical environment in which children develop and
273 healthy behaviors has also been demonstrated [3–5,31]. In the present study, children of

274 vulnerable families were less likely to use a toothbrush (especially an electrical device), hand-
275 washing soap, shower gel, or toothpaste, while one in four of them used a washbowl and wet
276 towel or sponge for body washing, reflecting the lack of opportunity to take a bath or shower.

277 Surprisingly, hand washing was not an established routine in the children, regardless
278 of their family or institutional setting, possibly because it was carried out without the
279 supervision of parents, despite being recommended as a family activity [32]. There was a
280 higher frequency of hand washing after defecation in both CRCs and CLFs, although it
281 continued to be low in the former, similar to the findings of a study in 11 developing countries
282 [33]. This practice requires special attention, given that education in hand washing has been
283 reported to reduce cases of diarrhea by 31% and cases of respiratory diseases by 21% [7,34].

284 Besides the biological implications of our findings, they are also relevant from a social
285 standpoint, confirming the value of the family as a key factor in the acquisition of healthy habits
286 [35]. Almost all CLFs and three-quarters of CRCs considered their families to be the main
287 agents for learning hygiene practices, with a role also being attributed by CLFs to healthcare
288 professionals and by CRCs to teachers, self-learning, and the mass media, which may reflect
289 the worse relationship of poorer families with healthcare systems [28,29]. These findings
290 suggest the need for educators and healthcare professionals to work together in the design and
291 implementation of strategies to improve the hygiene habits of children from vulnerable
292 families.

293 Weaknesses in the socialization function of the family were also revealed by the
294 CRCs, who were more likely to be rejected for being dirty or smelling bad and to be motivated
295 in their personal hygiene activities by the need to avoid this rejection. Hygiene behaviors play
296 an important role in the impression that we make on others and as a display of respect for social
297 norms [12], facilitating the integration and socialization of children among their peers. There
298 is a relationship among family vulnerability, diseases associated with poor hygiene (e.g., caries

299 and pediculosis), school problems, and marginalization [17,36,37]. The long-term social
300 effects of this situation are unclear; however, it appears likely to perpetuate the inequality and
301 vulnerability of these children, with negative consequences for their health in adulthood [38].

302 According to the Model of Health Promotion of the Family [35], the values, targets,
303 and needs of families mediate between their health practices and socioeconomic status. Hence,
304 despite the limited influence of nursing professionals on the SDHs affecting families, they may
305 be able to intervene in these mediators to improve health and hygiene practices. Family
306 interventions have achieved improvements in the acquisition of healthy lifestyles related to
307 physical activity and sport [39] and might therefore have a similar impact on personal hygiene
308 habits.

309 **Limitations**

310 This study contains certain limitations. The sample size of children from vulnerable
311 families was reduced due to difficulties in gaining access to this relatively small population,
312 although it proved possible to obtain significant differences with the children living at home.
313 There may have been a “volunteer” bias, given the response rate of only 60% for the CLFs,
314 and the study design means that causality relationships could not be established. Finally, the
315 lack of published data on this issue, especially in developed countries, limited the discussion
316 of our findings.

317 **Conclusions**

318 Our study provides new evidence on the relationship among SDHs, family, and the
319 personal hygiene practices of children. Our findings raise questions about the adequate
320 fulfillment by vulnerable families of their protection, healthcare, and socialization functions.
321 The results confirm that the family, understood as a complex system that acts on the health
322 behaviors of the individuals that form it, affects the personal hygiene practices of children.
323 Thus, deficient hygiene habits were observed in the offspring of families affected by the main

324 features of social inequality, who were more likely to perceive social rejection for this reason
325 and less likely to consider their family as the greatest influence on their personal hygiene
326 practices.

327 These findings indicate that action against social inequality can have a potential
328 impact on biological mechanisms that affect health. Although this inequality cannot be resolved
329 within the family setting, it can be ameliorated by promoting family practices designed to
330 improve personal hygiene habits.

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