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Jessica Klöckner Knorst

INFLUÊNCIA DO CAPITAL SOCIAL NA SAÚDE BUCAL DE CRIANÇAS E ADOLESCENTES

Santa Maria, RS
2022

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Tese apresentada ao Curso de Doutorado do Programa de Pós- Graduação em Ciências Odontológicas, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do grau de **Doutora em Ciências Odontológicas.**

Orientador: Prof. Dr. Thiago Machado Ardenghi
Coorientador: Mario Vianna Vettore

Santa Maria, RS
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Aprovado em 22 de julho de 2022.

Thiago Machado Ardenghi, Dr. (UFSM)
(Presidente/Orientador)

Branca Heloisa de Oliveira Martins Vieira (UERJ)

Flávio Fernando Demarco, Dr. (UFPel)

José Leopoldo Ferreira Antunes, Dr. (USP)

Saul Martins de Paiva (UFMG)

Santa Maria, RS
2022

DEDICATÓRIA

*A todas as **crianças** e **adolescentes** que fizeram parte desse estudo.*
Que a vida os presenteie com inúmeras coisas boas, e, que as adversidades na qual muitos vivem, não destrua o que há de melhor dentro de vocês.

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Há duas formas de viver a vida. Uma, é acreditar que não existe milagre. A outra, é acreditar que todas as coisas são um milagre.

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É sobre saber que em algum lugar
Alguém zela por ti

(Ana Vilela)

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meu jardim. Mas nunca o meu coração.

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Looking deeper through the telescope
You can see that your home's inside of you.

(Jason Mraz)

"*A vida não é sobre metas, conquistas e linhas de chegada. É sobre quem você se torna durante a caminhada*."

(Gisele Ferreira)

RESUMO

INFLUÊNCIA DO CAPITAL SOCIAL NA SAÚDE BUCAL DE CRIANÇAS E ADOLESCENTES

AUTORA: Jessica Klöckner Knorst
ORIENTADOR: Thiago Machado Ardenghi
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O capital social, cujo conceito abrange as consequências positivas da sociabilidade e da confiança social, tem sido destacado como um importante determinante social da saúde. Estudos prévios sugerem que o alto capital social beneficia a saúde bucal, entretanto, algumas questões relevantes em torno dessa relação ainda não foram exploradas. Assim, o objetivo dessa tese foi avaliar o impacto do capital social na saúde bucal de crianças e adolescentes. Para isso, foram desenvolvidos 4 artigos. O primeiro avaliou sistematicamente a associação entre capital social e desfechos de saúde bucal em crianças e adolescentes; o segundo explorou as vias diretas e indiretas pelas quais o capital social na primeira infância impacta na cárie dentária e qualidade de vida relacionada à saúde bucal (QVRSB) na adolescência; o terceiro avaliou o efeito moderador do senso de coerência (SDC) na relação entre capital social e QVRSB em escolares; e o quarto avaliou o período etário no qual a QVRSB é mais afetada pelo capital social experimentado na primeira infância. Para o estudo 1, dois revisores calibrados realizaram as buscas e seleção dos artigos em bases de dados relevantes, e posterior extração de dados para síntese narrativa e metanálise. Para os estudos 2, 3 e 4, foi iniciada uma coorte em 2010, com 639 pré-escolares (1-5 anos) em Santa Maria, Brasil. Os indivíduos foram reavaliados nos anos de 2012, 2017 e 2020, totalizando 10 anos de seguimento (taxa de retenção na coorte de 67,1%). O capital social comunitário e individual foram avaliados através da presença de instituições formais no bairro, das redes sociais individuais e confiança social. As medidas clínicas e subjetivas de saúde bucal incluíram a cárie dentária e a QVRSB. Características demográficas, socioeconômicas, comportamentais e psicossociais (SDC) também foram avaliadas. Os dados foram analisados por meio de Modelagem de Equações Estruturais para o estudo 2 e de Modelos Multiníveis de Regressão de Poisson para os estudos 3 e 4. Os resultados do estudo 1 demonstraram que o alto capital social foi associado a melhores desfechos clínicos e subjetivos de saúde bucal, com o maior impacto do capital social em nível comunitário. Os achados do estudo 2 demonstraram que o alto capital social comunitário na primeira infância impactou diretamente na menor ocorrência de cárie dentária e melhor QVRSB após 10 anos. O capital social em nível comunitário também previu indiretamente a menor ocorrência de cárie dentária por meio de vias psicossociais e comportamentais. O estudo 3 demonstrou que níveis elevados de SDC atenuaram o impacto negativo do baixo capital social individual na QVRSB. Os resultados do estudo 4 evidenciaram que o capital social individual na primeira infância afetou a QVRSB ao longo das ondas da coorte, enquanto que o de nível comunitário impactou mais a longo prazo. Com base nos estudos, conclui-se que altos níveis de capital social impactam positivamente em desfechos normativos e subjetivos de saúde bucal em crianças e adolescentes, sendo que o nível comunitário exerce um efeito cumulativo e de maior impacto. Além disso, a relação entre capital social e saúde bucal foi influenciada especialmente por fatores psicossociais.

Palavras-chave: Capital social. Crianças. Estudo longitudinal. Saúde bucal.

ABSTRACT

INFLUENCE OF SOCIAL CAPITAL ON ORAL HEALTH OF CHILDREN AND ADOLESCENTS

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ADVISOR: Thiago Machado Ardenghi
CO-ADVISOR: Mario Vianna Vettore

Social capital, whose concept encompasses the positive consequences of sociability and social trust, has been highlighted as one of the main social determinants of health. Previous studies suggest that high social capital benefits oral health, however, some relevant issues surrounding this association have not been explored yet. Thus, the aim of this thesis was to evaluate the impact of social capital on the oral health of children and adolescents. For this, 4 articles were developed. The first systematically evaluated the association between social capital and oral health outcomes in children and adolescents; the second explored the direct and indirect pathways in which social capital in early childhood impacts dental caries and oral health-related quality of life (OHRQoL) in adolescence; the third evaluated the moderating effect of the sense of coherence (SOC) on the relationship between social capital and OHRQoL in schoolchildren; and the fourth evaluated the age period in which the OHRQoL is most affected by the social capital experienced in early childhood. For study 1, two calibrated reviewers performed the searches and selection of articles in relevant databases, and subsequent data extraction for narrative synthesis and meta-analysis. For studies 2, 3 and 4, a cohort was started in 2010 with 639 pre-schoolers (1-5 years old) in Santa Maria, Brazil. Individuals were reassessed in 2012, 2017 and 2020, totalling 10 years of follow-up (cohort retention rate of 67.1%). Community and individual social capital were assessed through the presence of formal institutions in the neighbourhood, individual social networks and social trust. Clinical and subjective measures of oral health included dental caries and OHRQoL. Demographic, socioeconomic, behavioural, and psychosocial (SOC) characteristics were also assessed. Data were analysed using Structural Equation Modelling for study 2 and Multilevel Poisson Regression Models for studies 3 and 4. The results of study 1 demonstrated that high social capital was associated with better clinical and subjective oral health outcomes, with the greatest impact of social capital at the community level. The findings of study 2 demonstrated that high community social capital in early childhood directly impacted lower occurrence of dental caries and better OHRQoL after 10 years. Community-level social capital also indirectly predicted lower occurrence of dental caries through psychosocial and behavioural pathways. Study 3 demonstrated that high SOC levels attenuated the negative impact of low individual social capital on OHRQoL. The results of study 4 showed that individual social capital in early childhood affected OHRQoL across cohort waves, while community-level social capital had a more long-term impact. Based on the studies, it is concluded that high levels of social capital positively impact normative and subjective oral health outcomes in children and adolescents, with the community level having a cumulative and greater impact. Furthermore, the relationship between social capital and oral health was especially influenced by psychosocial factors.

Keywords: Children. Longitudinal study. Oral health. Social capital.

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LISTA DE ABREVIATURAS E SIGLAS

AAPD	American Academy of Pediatric Dentistry
CSDH	Commission on the Social Determinants of Health
CPI	Community Periodontal Index
CPO-D	Índice de Dentes Cariados, Perdidos e Obturados
CPQ	Child Perceptions Questionnaire
CPQ8-10	Child Perceptions Questionnaire para crianças de 8-10 anos
CPQ11-14	Child Perceptions Questionnaire para crianças de 11-14 anos
DSS	Determinantes Sociais da Saúde
ECOHIS	Early Childhood Oral Health Impact Scale
FDI	Federação Dentária Internacional
ICDAS	International Caries Detection and Assessment System, Sistema Internacional de Avaliação e Detecção de Cáries
IPC	Índice Periodontal Comunitário
MEE	Modelagem de equações estruturais
MOS	Medical Outcomes Study
OMS	Organização Mundial da Saúde
OHIP-14	Oral Health Impact Profile
OIDP	Impacts on Daily Performances
QVRSB	Qualidade de vida relacionada à saúde bucal
R$	Real
SOC-13	Antonovsk's 13-item questionnaire (SOC-13)
SDC	Senso de Coerência
T1	Levantamento epidemiológico (linha de base)
T2	Acompanhamento de 2 anos (2012)
T3	Acompanhamento de 7 anos (2017)
T4	Acompanhamento de 10 anos (2020)
TCLE	Termo de consentimento livre e esclarecido
UFSM	Universidade Federal de Santa Maria
WHO	World Health Organization

SUMÁRIO

1 APRESENTAÇÃO

Health inequalities and the social determinants of health are not a footnote to the determinants of health. They are the main issue.

(Michael Marmot)

É cada vez mais reconhecido que as doenças bucais são determinadas por uma série de fatores biológicos, psicológicos, comportamentais, sociais, ambientais e políticos (SOLAR; IRWIN, 2010; WILLIAMS, 2011; VART, 2022). Nesse contexto, um crescente corpo de evidências tem explorado os principais elementos e caminhos que ligam fatores mais amplos e que influenciam nos resultados de saúde bucal de uma maneira mais distal (LEE; DIVARIS, 2014). Dentre esses fatores, encontra-se o capital social, que tem sido destacado como um dos principais determinantes da saúde na estrutura conceitual dos determinantes sociais da Organização Mundial da Saúde (OMS) (SOLAR; IRWIN, 2010).

O capital social entrou em evidência na pesquisa científica, principalmente, por Pierre Bordieu (1986), James Coleman (1988) e Robert Putnam (1993); no entanto, ainda não há um consenso para a sua definição (BORDIEU, 1986; COLEMAN, 1988; PUTNAM, 1993). Para alguns autores, o capital social tem sido descrito como as características da estrutura social (como por exemplo a participação cívica, níveis de confiança e reciprocidade) que atuam como recursos acessados pelos indivíduos e que podem facilitar as ações coletivas (COLEMAN, 1988; PUTNAM, 1993; PUTNAM, 1995). Além disso, o capital social também tem sido definido como um recurso acessível às pessoas por meio da participação em vários tipos de redes sociais, possibilitando o alcance de certos objetivos, retornos ou benefícios que não seriam alcançados na ausência deste capital característico (COLEMAN, 1988; PUTNAM, 1995; ROSTILA, 2011).

Nesse sentido, o capital social pode ser entendido como os recursos sociais que evoluem em redes sociais acessíveis ou em estruturas sociais caracterizadas pela confiança mútua (COLEMAN, 1988; PUTNAM, 1993; ROSTILA, 2011). Esses recursos sociais, por sua vez, facilitam o acesso a vários retornos que podem beneficiar o indivíduo e o coletivo (ROSTILA, 2011). Um crescente número de estudos sugere que níveis elevados de capital social estão relacionados a menores taxas de mortalidade, melhor auto avaliação de saúde geral e melhor saúde mental (GILBERT et al., 2013; MOORE; KAWACHI, 2017; WATANABE et al., 2019). Além disso, altos níveis de capital social também têm sido relacionados a melhores desfechos

normativos e subjetivos de saúde bucal, como cárie, gengivite, auto percepção de saúde bucal e qualidade de vida (FONTANINI; MARSHMAN; VETTORE, 2015; GUPTA et al. 2015; TOMAZONI et al., 2017; VETTORE et al. 2019).

Nesse contexto, o capital social é considerado um conceito importante e que pode influenciar os diferentes desfechos de saúde bucal (ROUXEL et al. 2015). O alto capital social pode ser um importante aliado para promover melhorias efetivas no estado de saúde bucal, especialmente no período de transição entre a infância e a adolescência. Esse período é crucial para atenção em saúde, uma vez que é caracterizado por inúmeras mudanças biológicas, psicossociais e adaptações a estruturas sociais e ambientais (SILVEIRA et al., 2014), além do fato de que os indivíduos se encontram vulneráveis a diversos fatores de risco à saúde (HOLST; SCHULLER, 2012). Assim, estudar esses fatores em uma população infantil se torna importante, pois quanto maior o período que a criança vive em condições de privação social, maior a probabilidade de ela ter resultados de saúde adversos, além do fato de que esses problemas e as suas consequências não se refletem apenas na infância, mas podem persistir ao longo da vida (HOLST; SCHULLER, 2012; SILVEIRA et al., 2014; STRAATMANN et al., 2019).

Em adição, cabe ressaltar que a Academia Americana de Odontopediatria (*American Academy of Pediatric Dentistry* - AAPD) também tem reconhecido a influência de fatores sociais na saúde bucal durante a infância, incluindo o acesso a cuidados, comportamentos e as desigualdades em saúde bucal (AMERICAN ACADEMY OF PEDIATRIC DENTISTRY, 2017). Nesse sentido, tem sido encorajado que os profissionais de saúde bucal, bem como os formuladores de políticas, passem a reconhecer formalmente o papel que os determinantes sociais da saúde desempenham na criação e perpetuação das desigualdades na saúde bucal de crianças. Além disso, a AAPD tem apoiado a realização de pesquisas adicionais para entender os mecanismos subjacentes aos determinantes sociais da saúde bucal (AMERICAN ACADEMY OF PEDIATRIC DENTISTRY, 2017).

Assim, as estratégias para melhorar a saúde bucal que têm como alvo os determinantes mais distais de saúde parecem ser mais promissoras em termos de promoção de saúde bucal, visto que é mais importante focar nos recursos individuais e na capacidade de gerar saúde do que nas causas da doença (ERIKSSON, 2017; MOORE; KAWACHI, 2017; TSAI et al. 2020). Embora alguns estudos tenham evidenciado o papel do capital social em desfechos normativos e subjetivos de saúde bucal (FONTANINI; MARSHMAN; VETTORE, 2015; GUPTA et al. 2015; TOMAZONI et al., 2017; VETTORE et al. 2019), a literatura ainda não foi compilada para responder que desfecho de saúde bucal é mais afetado conforme os diferentes níveis de

influência de capital social, nem quais são os indicadores que mais influenciam nessa relação durante a infância e adolescência. Além disso, as vias teóricas pelas quais o capital social influencia na saúde bucal ainda não foram exploradas. Compreender os caminhos e indicadores específicos que ligam o capital social à saúde bucal pode contribuir para a elaboração de estratégias de saúde, colaborando assim para a amenização dos impactos causados pelas iniquidades sociais e visando uma melhora da saúde geral e bucal dessa população. Em adição, o efeito de possíveis fatores modificadores da relação entre capital social e saúde bucal, bem como o período da infância no qual a saúde bucal é mais afetada pela privação de capital social ainda não foram avaliadas na literatura prévia.

Assim, esta tese está estruturada em quatro artigos científicos. O primeiro é intitulado **"Social capital and oral health in children and adolescents: a systematic review and meta-analysis**", o qual objetivou avaliar sistematicamente a associação do capital social individual e comunitário com diferentes desfechos de saúde bucal em crianças e adolescentes. O segundo artigo é intitulado **"Pathways between social capital and oral health from childhood to adolescence"** e objetivou explorar as vias pelas quais o capital social individual e comunitário na primeira infância podem influenciar na cárie dentária e QVRSB na adolescência, avaliando o efeito direto e indireto de variáveis psicossociais e comportamentais. O terceiro artigo é intitulado **"Sense of coherence moderates the relationship between social capital and oral health-related quality of life in schoolchildren: a 10-year cohort study"** e teve como objetivo avaliar o efeito moderador do SDC na relação entre capital social e QVRSB em escolares. O quarto e último artigo é intitulado **"Impact of community and individual social capital during early childhood on oral health-related quality of life: a 10-year prospective cohort study"** e avaliou o impacto do capital social em nível individual e comunitário na primeira infância na QVRSB em diferentes períodos etários ao longo de 10 anos de acompanhamento.

1.1 REFERENCIAL TEÓRICO

Para que se compreenda o efeito do capital social nas condições de saúde bucal de crianças e adolescentes se faz necessário a utilização de um referencial teórico amplo e consistente acerca da literatura disponível. Por isso, esta seção está dividida em quatro seções terciárias.

Na primeira seção, há uma descrição a respeito da mudança de paradigmas ocorrida em saúde bucal, reforçando a importância de se considerar os fatores distais mais amplos que

exercem influência na saúde. Nessa seção também são apresentados modelos explicativos sobre os determinantes sociais da saúde.

Na segunda seção, as principais teorias e conceitos referentes ao capital social são abordadas. Além disso, também são apresentadas as principais classificações e indicadores do capital social utilizados na literatura. A discussão dessas teorias permite interpretar os diferentes significados que o capital social pode assumir na pesquisa, bem como suas implicações práticas e preventivas.

A terceira seção abrange a influência do capital social na saúde, destacando as principais vias que explicam esta relação, considerando micro e macro níveis. Nesse sentido, destaca-se que um fator pode influenciar a saúde através de diferentes mecanismos.

Na quarta seção, há uma contextualização e uma breve revisão de literatura a respeito da influência dos diferentes indicadores e níveis do capital social nas condições normativas e subjetivas de saúde bucal.

1.1.1 Determinantes sociais da saúde

O reconhecimento de que as condições nas quais os indivíduos vivem exerce impacto na sua saúde não é atual, entretanto, a busca pelos processos biológicos envolvidos na conexão entre saúde bucal e estrutura social resultou em um foco individual e não na sociedade em que as pessoas vivem (BRUNNER; MARMOT, 1999). Com base no modelo biomédico ou *downstream approach*, os profissionais de saúde bucal têm tradicionalmente focado as abordagens preventivas e educacionais na alteração dos comportamentos individuais, considerados até então a principal causa responsável pelo processo saúde-doença (WATT, 2007; WATT; DO; NEWTON, 2015).

Nesse contexto, esse modelo intervencionista e focado no estilo de vida tem dominado a prática preventiva em todo o mundo (WATT; DO; NEWTON, 2015). No entanto, os pressupostos subjacentes para essa abordagem estreita e reducionista são fundamentalmente falhos, visto que de forma isolada não são efetivos para a manutenção de hábitos saudáveis e redução das iniquidades em saúde (WATT; MARINHO, 2005; ADAIR et al. 2013; CLAUSS et al. 2021). Essas limitações se devem ao fato de que o comportamento humano é extremamente complexo, uma vez que os estilos de vida não são livremente escolhidos e nem facilmente modificáveis, além de que o conhecimento e a conscientização sobre a saúde são insuficientes quando não existem recursos e oportunidades para a mudança (WATT, 2007). Nesse sentido, evidencia-se a necessidade de examinar as características da vida social, que

embora impactem na saúde bucal e estilo de vida dos indivíduos, não são redutíveis a esses (SISSON, 2007; SHEIHAM et al., 2011).

Esse cenário incentivou uma ampla mudança de paradigmas em saúde, onde o foco, que antes era direcionado unicamente ao indivíduo, têm sido reorientado para uma atuação mais ampla e que leve em consideração o contexto social (WATT, 2007). Dessa forma, foi desenvolvido o modelo biopsicossocial ou *upstream approach,* a fim de fornecer uma base para uma melhor compreensão da saúde e de seus determinantes (ROSE, 2001). O modelo biopsicossocial reforça a necessidade da criação de ambientes sociais que proporcionem uma boa saúde aos indivíduos, além do fortalecimento da ação comunitária e reorientação dos serviços de saúde (WATT, 2007). Assim, essa abordagem reconhece o papel de determinantes subjacentes, como fatores psicossociais, econômicos, políticos e ambientais, conhecidos como os Determinantes Sociais da Saúde (DSS), ou seja, as causas das causas (MARMOT; WILKINSON, 1999).

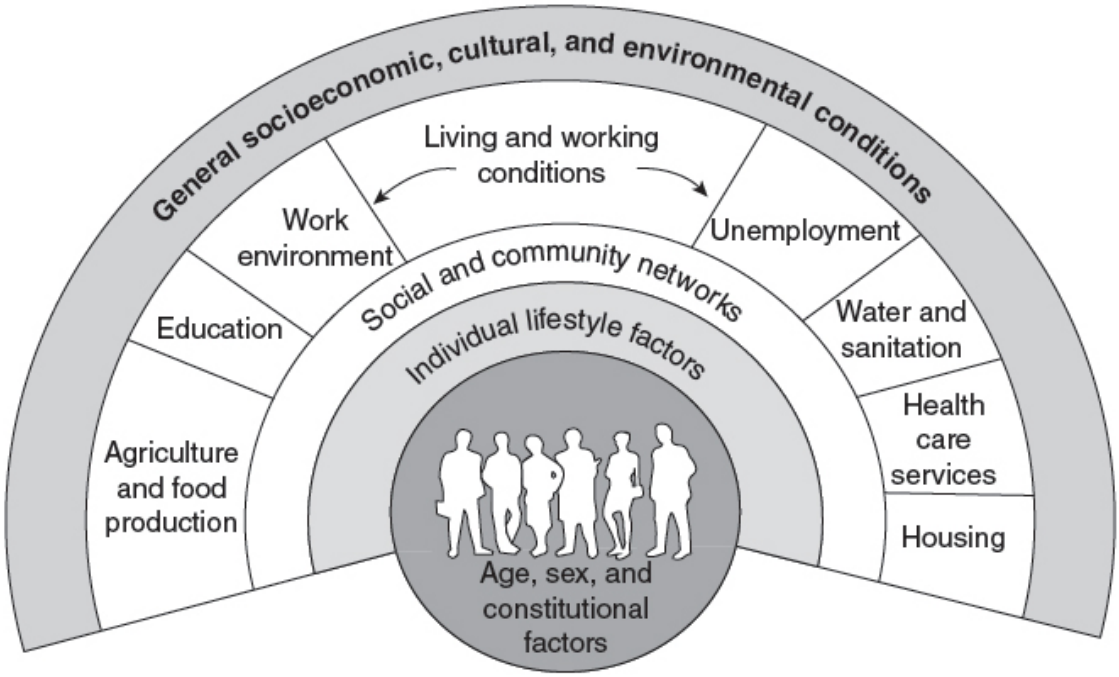
Os DSS englobam as circunstâncias em que os indivíduos nascem, crescem, vivem, trabalham e envelhecem (MARMOT et al., 2008). Mais especificamente, são os determinantes estruturais que configuram e mantém a hierarquia social através de mecanismos sociais e políticos (MARMOT et al., 2008). Existem múltiplas definições de DSS e estas expressam, com maior ou menor detalhamento, o conceito generalizado de que as condições de vida e trabalho dos indivíduos ou de grupos populacionais estão ligadas às suas condições de saúde (BUSS; PELLEGRINI FILHO, 2007).

Nesse contexto, alguns modelos teóricos foram desenvolvidos com o intuito de melhor descrever a relação existente entre diferentes fatores - individuais e contextuais - e saúde (DAHLGREN; WHITEHEAD, 1991; BRUNNER; MARMOT, 2006; SOLAR; IRWIN, 2010; WATT; SHEIHAM, 2012). Independente do modelo, é essencial que o mesmo contemple aspectos importantes como: (a) elucidar os mecanismos pelos quais os determinantes sociais causam as iniquidades em saúde; (b) demonstrar como os principais determinantes sociais interagem entre si e nos diferentes níveis de abrangência; (c) avaliar as prioridades para os DSS; e (d) mapear as competências específicas de intervenção e os pontos de ação dos projetos sobre os DSS (COMISSION ON SOCIAL DETERMINANTS OF HEALTH, 2007).

O primeiro modelo proposto foi o de Dahlgren e Whitehead (1991), o qual sugere a existência de uma rede de relações entre fatores em diferentes hierarquias ou níveis, demonstrando que os fatores individuais são influenciados pelas redes sociais e estas por condições socioeconômicas, culturais e ambientais nas quais os indivíduos estão inseridos (Figura 1). Na camada mais externa, encontram-se os macros determinantes, como as condições

socioeconômicas, culturais e ambientais, consideradas influentes para os demais níveis. Logo abaixo, estão representados os fatores de condição de vida e de trabalho, tais como educação, emprego, habitação e serviços de saúde. O nível seguinte destaca as redes sociais, as quais influenciam o estilo de vida das pessoas, localizado na camada inferior. O último nível do modelo contempla as características individuais, como fatores hereditários, gênero e idade (DAHLGREN; WHITEHEAD, 1991). Cabe ressaltar que esse modelo teve uma atualização recentemente publicada (DAHLGREN; WHITEHEAD, 2021).

Figura 1 – Modelo conceitual proposto por Dahlgren e Whitehead (1991)

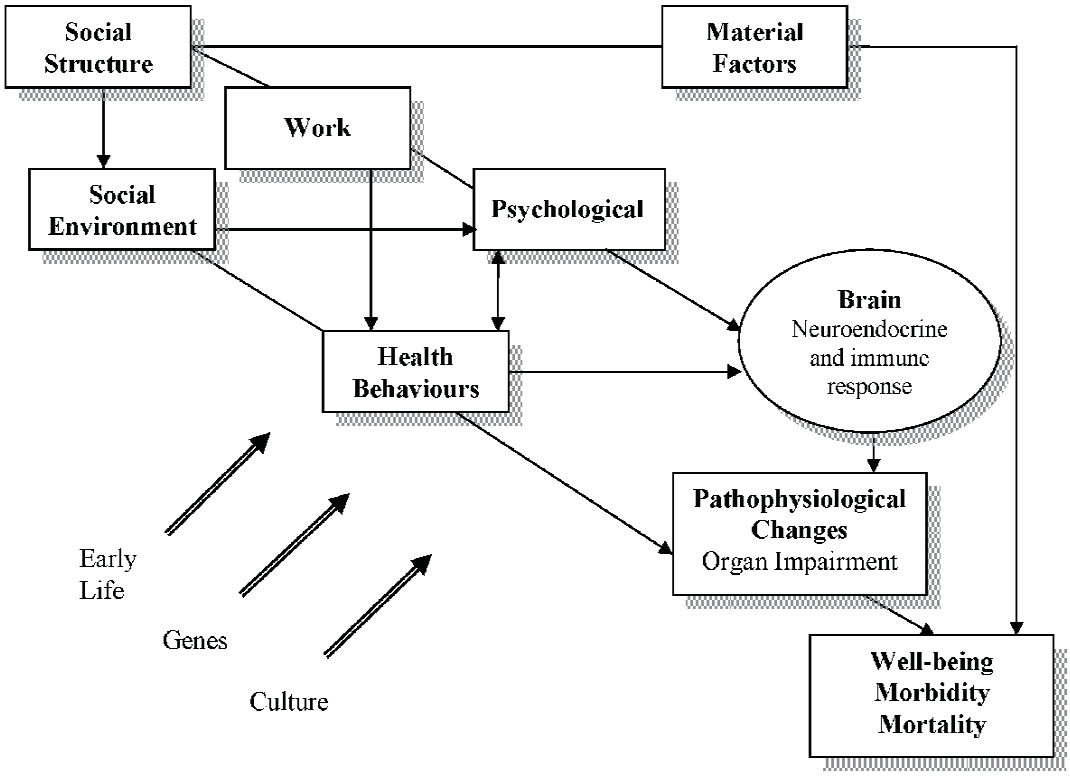


Fonte: (DAHLGREN; WHITEHEAD, 1991, p. 11).

Outro modelo teórico amplamente disseminado foi o proposto por Brunner e Marmot no ano de 1992, o qual foi atualizado tendo a sua última versão publicada no ano de 2006 (Figura 2) (BRUNNER; MARMOT, 2006). Neste modelo, é demonstrado os diferentes caminhos, tanto diretos como indiretos, pelos quais os determinantes sociais influenciam de uma maneira mais distal na saúde e dia a dia das pessoas. Dentro desses fatores estão as condições mais amplas e estruturais, como o ambiente de trabalho e moradia. Assim, considera-se a estrutura social e ambiental como influenciadores indiretos, os quais, por intermédio de questões materiais, psicológicas e comportamentais, impactam em desfechos de saúde ou doença do indivíduo. Em adição, o modelo de Brunner e Marmot também destaca os fatores

aos quais os indivíduos estão expostos no início da vida, bem como os fatores culturais. Além disso, esse modelo também considera as diferentes predisposições genéticas, resposta imunológica individual e atividade cerebral para explicar os diferentes aspectos de saúde e doença vivenciados pelos indivíduos.

Figura 2 – Modelo conceitual proposto por Brunner e Marmot (2006)



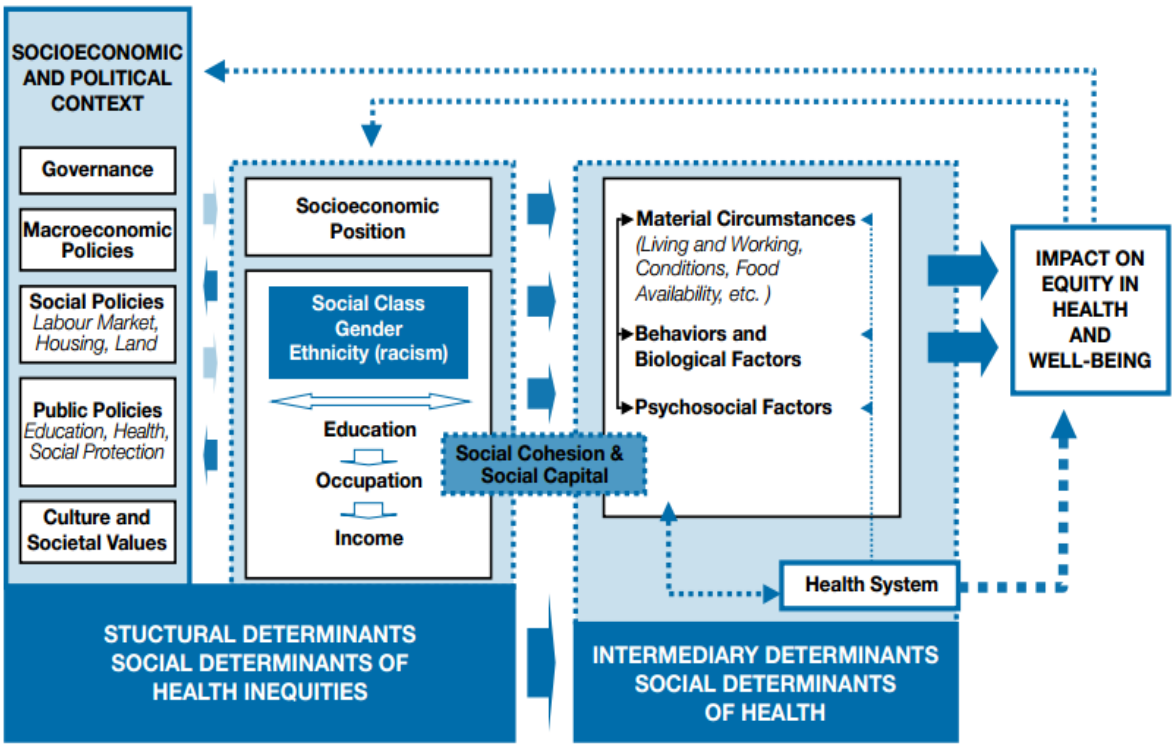
Fonte: (BRUNNER; MARMOT, 2006, p. 9).

Posteriormente, a Comissão sobre Determinantes Sociais de Saúde da OMS sugeriu um novo modelo conceitual (Figura 3), no qual reuniu diversos elementos dos modelos publicados previamente (SOLAR; IRWIN, 2010). O modelo é composto por dois blocos principais, sendo o primeiro referente aos determinantes sociais e estruturais das iniquidades em saúde, e o segundo – impactado pelo primeiro – envolvendo os determinantes intermediários, os quais podem influenciar na saúde e bem-estar dos indivíduos. Os determinantes sociais se referem ao contexto político-socioeconômico, como a governança, políticas e cultura, as quais não podem ser medidas diretamente no nível individual. Os determinantes estruturais individuais se referem às características socioeconômicas das pessoas, como gênero, raça, educação e renda. Os fatores intermediários se ligam tanto aos determinantes estruturais quanto ao grupo de

fatores individuais, incluindo os comportamentos relacionados à saúde, fatores psicológicos, biológicos e os sistemas de saúde (SOLAR; IRWIN, 2010).

O modelo proposto também se destaca pelo fato de incluir um componente transversal, o qual representa o capital social e a coesão social (SOLAR; IRWIN, 2010). A posição transversal desse fator se deve às divergências no meio científico quanto à caracterização desses recursos como propriedade de indivíduos, grupos ou comunidades. Nesse contexto, o capital social e a coesão social em modelos de determinação social podem ser considerados como um componente estrutural ou intermediário, ou ambos (SOLAR; IRWIN, 2010).

Figura 3 – Modelo conceitual proposto pela Comissão sobre os Determinantes Sociais de Saúde



Fonte: (SOLAR; IRWIN, 2010, p. 6).

Considerando esse cenário, as intervenções para reduzir iniquidades em saúde bucal devem ser fundamentadas nas suas origens e no seu complexo processo desencadeador. Estudos prévios ressaltaram que identificar um fator causal conhecido sem levar em consideração os determinantes sociais é ineficaz (NEWTON; BOWER, 2005; WATT, 2005). Esta questão reflete a incapacidade de os programas de educação em saúde bucal impactar de forma homogênea os comportamentos de saúde bucal em diferentes grupos sociais, aumentando as desigualdades (KAY; LOCKER 1996). Nesse contexto, algumas abordagens têm focado em

estratégias para facilitar a promoção de saúde bucal, como por exemplo, a análise de curso de vida (PERES et al. 2018), o modelo salutogênico (ANTONOVSKY, 1987; ERIKSSON, 2017) e o capital social (MOORE; KAWACHI, 2017).

1.1.2 Capital social

Trustworthiness lubricates social life.

(Robert Putnam)

O conceito de capital social tem sido amplamente inserido nas discussões de saúde nas últimas décadas (MOORE; KAWACHI, 2017). Nesse sentido, o capital social se tornou um termo popular e tem sido destacado como um dos principais determinantes da saúde na estrutura conceitual dos determinantes sociais da OMS (SOLAR; IRWIN, 2010). O conceito de capital social se concentra nas consequências positivas da sociabilidade e coloca essas consequências na discussão mais ampla do capital. Apesar das controvérsias em relação à sua definição e às inúmeras críticas (SALISU; HASHIM, 2017; VILLALONGA-OLIVESA; KAWACHI, 2017), um crescente número de evidências sugere que níveis elevados de capital social beneficiam a saúde geral e bucal (ROUXEL et al. 2015; MOORE, KAWACHI, 2017).

1.1.2.1 Teoria do capital social

Um dos primeiros teóricos que influenciou a noção de capital social foi Pierre Bourdieu (1986). Segundo a sua teoria, o capital social pode ser definido como o agregado de recursos que estão ligados a um indivíduo ou a um grupo por meio de uma rede de relações formais ou informais de conhecimento e reconhecimento mútuo. Em outras palavras, o capital social pode ser definido como a adesão a um grupo que fornece aos seus membros o benefício de usufruir desse capital, bem como a quantidade e qualidade desses recursos. Essa teoria, apesar de reconhecer as redes sociais em nível comunitário, enfatiza a capacidade do indivíduo em usufruir desses recursos para benefício individual (BOURDIEU, 1986).

Coleman (1988) define o capital social pela sua função. Nesse sentido, o capital social é definido como uma variedade de entidades com características em comum, as quais consistem em aspectos da estrutura social e que facilitam a ação dos indivíduos dentro da estrutura. Assim, o capital social é caracterizado como um recurso de ação podendo ser dividido em três formas:

(a) obrigações, expectativas e confiabilidade, referente à reciprocidade, confiabilidade e à troca de favores entre os indivíduos; (b) canais de informação, a qual é essencial para as ações e inerente às relações sociais; (c) normas e sanções efetivas, as quais tem poderosos efeitos facilitadores ou de restrição nas ações dos indivíduos. Portanto, o capital social é produtivo e pode ser entendido como um recurso acessível às pessoas por meio da participação em diferentes tipos de redes sociais, possibilitando o alcance de certos objetivos, retornos ou benefícios que não seriam obtidos na ausência deste capital característico (COLEMAN, 1988).

Putnam (1993) definiu o capital social como características da organização social, como redes, normas e confiança, as quais facilitam as ações coordenadas e podem melhorar a sociedade como um todo. Uma comunidade com capital social elevado é caracterizada por associações fortes e cidadãos ativos, os quais agem de forma eficaz para alcançar objetivos compartilhados. Nesse sentido, o capital social, além de ser um bem privado, também pode ser entendido como um bem coletivo, beneficiando os indivíduos dentro da comunidade, independente das conexões individuais. Assim, uma comunidade com o capital social elevado pode beneficiar todos indivíduos, inclusive os socialmente isolados e com baixo capital social individual (PUTNAM, 1993).

Portes (1998) acrescenta ao conceito de capital social a distinção de fontes e efeitos do mesmo. As fontes seriam as características das redes em si (motivações para disponibilizar recursos), enquanto os efeitos seriam os recursos reais fornecidos (suporte, oportunidades e informações). Portes ainda faz uma importante contribuição quando reconhece as faces negativas do capital social, enfatizando que os mesmos laços que beneficiam os membros de uma rede também podem levar à exclusão de pessoas externas (PORTES, 1998).

Posteriormente, Lin (2001) definiu o capital social como os recursos incorporados nas redes sociais, os quais podem ser acessados e mobilizados através dos laços existentes dentro ou entre redes. Assim, o capital social foi caracterizado como a quantidade e qualidade de recursos que um ator (indivíduo, grupo ou comunidade) pode acessar de acordo com a sua posição em uma rede social. Esse conceito evidencia a importância das redes sociais como estrutura de relacionamento entre os indivíduos (LIN, 2001).

Outra distinção do capital social é em relação aos outros tipos de capital. Segundo a Organização para Cooperação e Desenvolvimento Econômico (COTE; HEALY, 2001), o capital social é diferente e menos tangível que o capital humano e físico, uma vez que está incorporado nas relações entre as pessoas. Nesse sentido, o capital social é inerente a relacionamentos estruturados e, por isso, é considerado um bem público que é compartilhado por um grupo de pessoas, e não um bem individual. Nessa perspectiva, para possuir capital

social, uma pessoa deve estar relacionada a outras, visto que estas são a fonte dos recursos e, consequentemente, a sua real vantagem (COTE; HEALY, 2001).

1.1.2.2 Classificação do capital social

O desenvolvimento teórico do capital social e o processo de migração da sociologia para outras disciplinas contribuíram para a divergência de conceitos e numerosas classificações em dimensões ou subtipos de capital social. Muitas dessas classificações, além disso, orientaram a operacionalização individual e contextual do conceito.

Alguns pesquisadores têm sugerido que o capital social apresenta duas dimensões: estrutural e cognitiva (KRISHNA; SHRADER, 1999; HARPHAM et al., 2002). O componente estrutural é o lado quantitativo do capital social, o qual se refere à extensão e à intensidade de participação em associações ou em outras formas de atividade social. O componente cognitivo é o lado qualitativo e menos tangível do capital social, o qual se refere à percepção das pessoas sobre a confiança interpessoal, solidariedade e reciprocidade. Em outras palavras, a dimensão estrutural se refere à quantidade de redes que os indivíduos possuem e a dimensão cognitiva se refere à forma como os indivíduos se sentem perante essas redes (KRISHNA; SHRADER, 1999; HARPHAM et al., 2002).

Outra construção importante é a distinção entre vínculo, ponte e ligação do capital social. O vínculo ("*bonding*") do capital social se refere às relações entre membros de uma rede de indivíduos semelhantes, como por exemplo, a relação entre familiares e amigos. A ponte ("*bridging*") do capital social está relacionada aos laços que ligam redes mais amplas, como por exemplo, entre indivíduos de diferentes comunidades. E por fim, o capital social de ligação ("*linking*") se refere à rede de relações e alianças com indivíduos ou grupos em posição de poder na sociedade (SZRETER; WOOLCOCK, 2004).

Em adição, as redes sociais também se distinguem em relações igualitárias "horizontais" e relações hierárquicas "verticais". As redes horizontais se referem às relações entre os membros de uma rede que se veem como similares (vínculos) ou distintos em alguma identidade demográfica ou social (ponte). O capital social vertical, ou de ligação, consiste nos laços verticais entre pessoas pertencentes a diferentes níveis hierárquicos de poder, sejam eles formais ou institucionalizados (SZRETER; WOOLCOCK, 2004).

A confiança social também tem sido destacada como um componente cognitivo essencial do capital social. Nesse contexto, algumas classificações relacionadas à confiança social também foram sugeridas. Putnam (2000) divide a confiança social em confiança espessa

e fina. A confiança espessa está incorporada nas relações entre familiares e amigos íntimos, caracterizadas como múltiplas e de longa duração. A confiança fina se refere a uma confiança geral nas pessoas, caracterizada por laços menos íntimos e infrequentemente mantidos (PUTNAM, 2000).

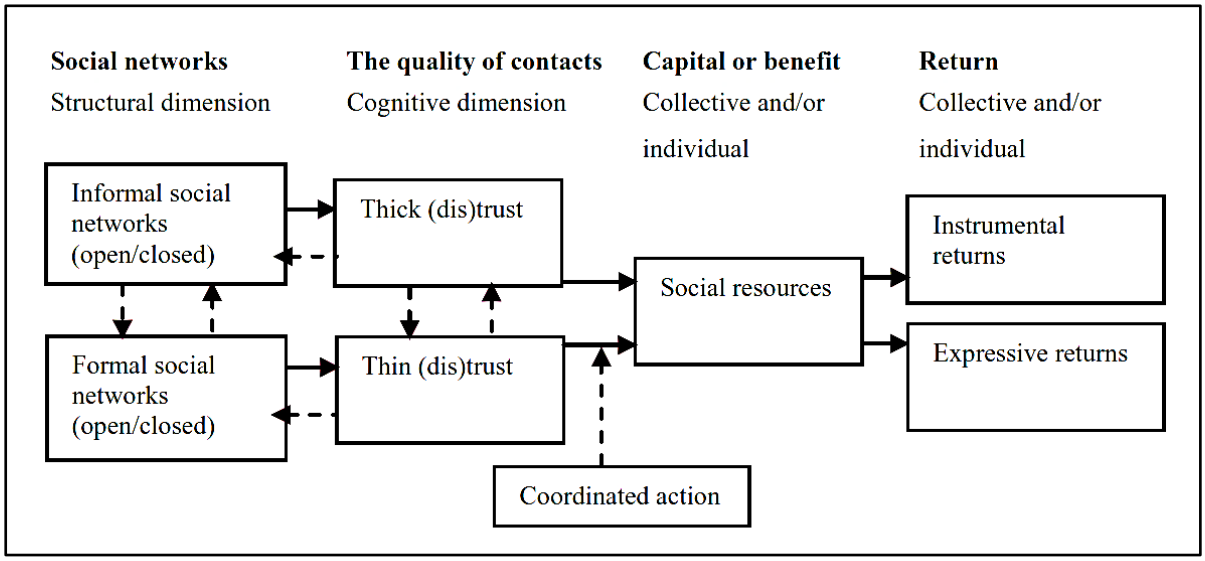
Ainda hoje, o fato do capital social ser um recurso individual ou coletivo é questão de debate. Nesse contexto, a principal lacuna entre as diferentes abordagens do capital social é o não reconhecimento da existência um do outro (ROSTILA, 2011). Com o intuito de superar estas divergências, Kawachi, Subramanian e Kim (2008) definiram o capital social como um atributo individual e coletivo. Nesta lógica, o capital social reside nas estruturas sociais, como bairros e ambientes de trabalho, bem como nas fontes que as pessoas acessam por meio das suas redes sociais (KAWACHI; SUBRAMANIAN; KIM, 2008). Assim, as ações coordenadas de indivíduos dentro de uma estrutura social podem gerar recursos coletivos, bem como ações coletivas podem gerar recursos que beneficiem o indivíduo (ROSTILA et al. 2011).

Com base nesse cenário e na tentativa de organizar as diferentes dimensões e níveis do capital social, Rostila (2011) elaborou um modelo que visa abranger as múltiplas faces do capital social (Figura 4). O modelo proposto sugere que o capital social tem uma dimensão estrutural (quantitativa) e uma dimensão cognitiva (qualitativa), e que ambas as dimensões são pré-condições para o capital social. A dimensão estrutural se refere à quantidade, estrutura e aos diferentes tipos de redes sociais. Além disso, essas redes são divididas em informais (laços fortes e vínculos entre familiares e amigos) e formais (pontes ou laços fracos criados em associações voluntárias, na vida profissional e em outras instituições formais). A dimensão cognitiva se relaciona ao nível de confiança social inerente das relações sociais, representando a condição prévia qualitativa para a criação do capital social. Considerando os subtipos de confiança, a espessa se refere aos laços frequentes e fortes, enquanto a confiança fina se refere à confiança geral entre as pessoas (ROSTILA et al. 2011).

Os recursos sociais são considerados os elementos centrais do capital social, representando o “capital” incorporado nas redes e estruturas sociais e que proporciona retornos individuais e coletivos. No entanto, o tipo e grau de confiança social são considerados os verdadeiros facilitadores no intercâmbio mútuo de recursos sociais. Nesse sentido, relações baseadas na confiança são fundamentais para a troca de recursos dentro das redes. Quando se trata de capital social coletivo, a confiança social facilita a formação de recursos sociais através da ação coordenada. Por conseguinte, uma condição prévia necessária na formação de recursos sociais mútuos é que as pessoas se unam e cooperem entre si. Assim, enquanto os recursos sociais individuais significam "capital" exclusivo que um indivíduo pode adquirir através das

suas relações sociais, permitindo a realização de fins individuais, o capital social coletivo significa recursos não exclusivos e que se formam através da cooperação e ação coordenada por pessoas em uma estrutura social, a qual lhes permitem alcançar objetivos compartilhados (ROSTILA, 2011).

Figura 4 – Modelo conceitual multinível que liga as múltiplas faces do capital social



Fonte: (ROSTILA, 2011, p. 316).

O modelo proposto também sugere que os recursos sociais gerados através de redes caracterizadas pela confiança proporcionam vários retornos, consideradas consequências do capital social, e não o capital social em si. Lin (2001) sugere duas categorias de retornos individuais do capital social: instrumental e expressivo. Retornos instrumentais se referem a ganhos econômicos, materiais, políticos e status. Os retornos expressivos são relacionados ao apoio emocional gerado, o que resulta em saúde física e mental. Em relação ao capital social coletivo, os retornos instrumentais refletem na saúde pública, desempenho econômico, democracia e níveis de criminalidade. Em relação ao retorno expressivo, enfatiza-se o aumento do bem-estar psicológico e físico como consequência da participação em grupos de apoio ou da presença de associações comunitárias (LIN, 2001; ROSTILA et al. 2011).

Em resumo, o capital social é composto por três componentes fundamentais: redes sociais, confiança social e recursos sociais. No entanto, os dois primeiros componentes (redes sociais e confiança social) são considerados pré-condições para a formação do último (recursos sociais). Nesse sentido, o capital social pode ser entendido como os recursos sociais que evoluem a partir de redes sociais acessíveis ou estruturas sociais caracterizadas pela confiança

mútua. Esses recursos sociais, por sua vez, facilitam o acesso a vários retornos que podem beneficiar o indivíduo e o coletivo (ROSTILA, 2011).

1.1.2.3 Mensuração e indicadores do capital social

Em razão da complexidade e ambiguidade em torno do seu conceito, não existe uma forma perfeita ou completa de se avaliar o capital social. Além disso, cabe ressaltar que o capital não pode ser medido diretamente, no entanto, pode ser inferido a partir de seus determinantes ou manifestações (ROSTILA, 2011). Os determinantes do capital social são fatores que influenciam as interações sociais, permitindo assim a sua formação. Em contrapartida, as manifestações são os resultados provenientes do capital social. Nesse contexto, o capital social é comumente medido através de indicadores ou "proxies", os quais estão ligados teoricamente ao conceito, tanto em nível individual como comunitário (ROSTILA, 2011).

Indicadores individuais comumente utilizados se referem à participação social, como a participação em organizações, ação política e envolvimento cívico (VEENSTRA, 2000; AIDA et al. 2011a; LAMARCA et al. 2013); ao nível de capacitação, representando a satisfação com a vida e a percepção de acontecimentos e controle ao seu redor; à percepção da comunidade, relacionada aos níveis de satisfação em relação à residência comunitária (CAUGHY, 2003); às redes sociais ou de apoio, como o contato com amigos e familiares, sistemas de suporte, participação religiosa e a profundidade dos relacionamentos (HYYPPÄ; MAKI, 2001; GUEDES et al. 2014; TOMAZONI et al., 2017); e à confiança social, referindo-se aos níveis de confiança e reciprocidade nas pessoas e instituições em geral (VEENSTRA, 2000; AIDA et al. 2011a).

Questões comumente utilizadas para avaliar o capital social individual através de indicadores são: "Nos últimos 12 meses, você participou de um grupo voluntário?" (KNORST et al. 2019, p. 1776) ou "Nos últimos 12 meses, você visitou um vizinho ou um vizinho visitou você?" (GUEDES et al. 2014, p. 2523); ou "Geralmente falando, você diria que a maioria das pessoas pode ser confiável?" (AIDA et al., 2011b, p. 1563, tradução nossa).

O capital social em nível comunitário também tem sido avaliado. Alguns estudos utilizaram indicadores de redes sociais comunitárias, como o número de entidades na comunidade, entre elas, a quantidade de associação de trabalhadores, de voluntários e centros culturais comunitários (AIDA et al., 2008; GUEDES et al. 2014; KNORST et al. 2019). O capital social comunitário também tem sido avaliado através do número de participantes em reuniões administrativas e número de homicídios (PATUSSI et al., 2001), além das taxas de

indivíduos reportando ausência de confiança e não voluntariado (AIDA et al., 2011b). Em adição, alguns estudos também se remetem ao capital social comunitário através da agregação de dados de capital social individual (AIDA et al. 2008; LAMARCA et al. 2014).

Cabe ressaltar que alguns instrumentos foram desenvolvidos e validados para mensurar o capital social, como o *Adapted Social Capital Assessment Tool* (HARPHAM; GRANT; THOMAS, 2002) e o *Integrated Questionnaire to Measure Social Capital* (GROOTAERT et al., 2004). Além disso, instrumentos específicos para medição do apoio social também foram desenvolvidos, como a escala utilizada no *Medical Outcomes Study* (MOS) (SHERBOURNE; STEWART, 1991), que foi posteriormente validada para a versão brasileira (GRIEP et al., 2003). Alguns autores também desenvolveram questionários com base em questões comumente utilizadas na literatura do capital social, como por exemplo o "*30-item social capital index*" (PATUSSI; HARDY; SHEIHAM, 2006).

Nesse contexto, pode-se observar que há uma divergência e inúmeras maneiras de mensurar os fatores relacionados ao capital social. Esse fato pode ser explicado pela complexidade e subjetividade dos blocos que compõem o capital social, dos diferentes níveis de agregação, além do fato de que poucos índices foram sujeitos a testes de validade e confiabilidade (PAXTON, 1999; ROSTILA, 2011). Nesse sentido, a maioria dos pesquisadores comumente utiliza indicadores, o que gera críticas, visto que o capital social é um conceito multidimensional e que dificilmente é completamente capturado com poucas variáveis (PAXTON, 1999). No entanto, vale ressaltar que o capital social é um conceito que não pode ser diretamente medido. Assim, a utilização de indicadores pode ser mais adequada em termos de saúde pública, uma vez que evidencia direta e indiretamente os pontos de ação.

1.1.3 Capital social e saúde

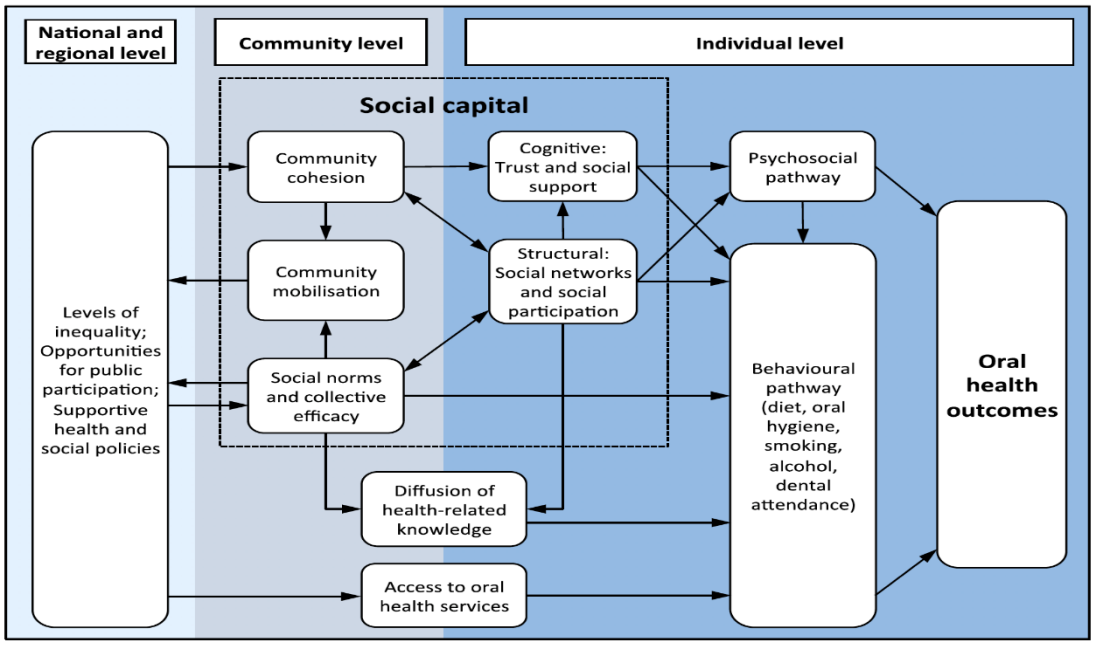
Diferentes estudos têm demonstrado que as doenças não ocorrem como um fenômeno isolado, e sim como uma característica das pessoas e do seu ambiente (SISSON, 2007), que não se refere apenas ao lar, mas também ao contexto circundante, como por exemplo, a comunidade, escola, local de trabalho e núcleo familiar (KOUVONEN et al. 2008; DIEZ-ROUX; MAIR, 2010). Nesse sentido, tem sido sugerido que o ambiente social compartilhado exerce um efeito significativo na saúde das pessoas, independentemente do seu nível de risco individual (DIEZ-ROUX et al., 2001; KALFF et al., 2001).

Nesse contexto, um forte corpo de evidências liga as relações sociais em termos de rede social e apoio social como determinantes chaves na saúde. Um número crescente de estudos

sugere que níveis elevados de capital social estão relacionados a menores taxas de mortalidade, de doenças crônicas, bem como menores índices de depressão e suicídio (DIEZ-ROUX et al., 2001; GILBERT et al., 2013; SMITH; KAWACHI, 2014; WATANABE et al. 2019). Também tem sido demonstrado que altos níveis de capital social estão relacionados a uma melhor saúde mental, melhor autopercepção de saúde e maior qualidade de vida (GILBERT et al., 2013; HASSANZADEH et al. 2016).

Diversos caminhos hipotéticos têm sido desenvolvidos para explicar a ligação entre capital social e saúde em micro e macro níveis. No nível micro, encontram-se as vias: (a) comportamental; (b) psicossocial; (c) acesso aos serviços de saúde; e no nível macro, a via (d) desenvolvimento de políticas públicas de apoio (KAWACHI; BERKMAN, 2000; ROUXEL et al., 2015). Essas vias podem atuar em nível comunitário e/ou individual e repercutir na saúde a partir de diferentes aspectos do capital social (Figura 5).

Figura 5 – Vias pelas quais o capital social individual e comunitário afetam a saúde



Fonte: (ROUXEL et al., 2015, p. 100).

A via comportamental considera que o capital social pode exercer influência nos comportamentos de saúde através de normas sociais e controle social informal (pressão dos pares), bem como através da influência e difusão de conhecimentos (CHRISTAKIS; FOWLER, 2008; ROUXEL et al., 2015). Nesse sentido, altos níveis de capital social podem levar os indivíduos a adotarem comportamentos favoráveis à saúde, bem como facilitar a difusão de

normas e hábitos saudáveis (KAWACHI; BERKMAN, 2000). Contrariamente, baixos níveis de capital social estão relacionados a comportamentos prejudiciais à saúde, como por exemplo, o uso de cigarro (ISLAM; FOLLAND; KAARBØE, 2017).

A teoria psicossocial considera que níveis elevados de capital social, por exemplo, dentro de uma comunidade ou entre redes sociais individuais, atuam na saúde como um fator de proteção ao estresse por meio do acesso ao suporte social, bem como através de sentimentos de segurança e pertencimento (UPHOFF et al., 2013; ROUXEL et al., 2015). Assim, o apoio social tem recebido grande importância como um recurso para lidar com o estresse, visto que interage com o estilo de enfrentamento natural e a resiliência das pessoas (MATO et al., 2017). Por outro lado, indivíduos que vivenciam níveis elevados de estresse são mais propensos à adotarem estilos de vida nocivos à saúde (SISSON, 2007), além de apresentarem pior saúde mental e qualidade de vida (HASSANZADEH et al. 2016).

Em relação a teoria do acesso aos serviços de saúde, uma possível explicação é que comunidades com alto nível de capital social são mais engajadas e mais bem-sucedidas em lutar por serviços sociais e saúde de boa qualidade (BURR; LEE, 2012; ROUXEL et al., 2015). Em adição, o suporte social e as inter-relações entre os indivíduos na comunidade aumentam a procura e acesso aos serviços de saúde (DEROSE et al. 2009; BURR; LEE, 2012). No entanto, o isolamento social (relacionado ao baixo capital social), está associado a uma baixa procura aos serviços e menores cuidados em saúde (BURR; LEE, 2012).

O mecanismo de desenvolvimento de políticas públicas de apoio se explica através da teoria da coesão social, onde comunidades mais coesas são mais "empoderadas" e mais engajadas politicamente, o que pode influenciar na tomada de decisões e no desenvolvimento de políticas sociais e de saúde mais favoráveis (KAWACHI; BERKMAN, 2000; ROUXEL et al., 2015). Nesse sentido, comunidades com altos níveis de capital social podem influenciar diretamente na alocação de recursos no bairro, bem como levar a maiores níveis de investimento público, o que influencia na maior disponibilidade e acesso aos serviços de saúde (KAWACHI; BERKMAN, 2000).

1.1.4 Capital social e condições de saúde bucal

Embora as doenças bucais sejam amplamente evitáveis, elas ainda atingem cerca de 4 bilhões de pessoas mundialmente (MARCENES et al., 2013; PERES et al. 2019) e causam um alto impacto econômico (LISTL et al., 2015), refletindo desigualdades sociais e econômicas generalizadas, particularmente em países de média e baixa renda (PETERSEN, 2003; PERES

et al. 2019). Nesse sentido, os diferentes agravos bucais ainda são considerados um problema de saúde pública. Além dos impactos materiais, as doenças bucais também geram inúmeras consequências para o bem-estar e qualidade de vida dos indivíduos acometidos (PIOVESAN et al., 2010; ORTIZ et al., 2014; TOMAZONI et al., 2014; CHAFFEE et al., 2017; MALELE-KOLISA et al. 2019).

A qualidade de vida tem sido considerada um parâmetro válido na avaliação do paciente em todas as áreas dos cuidados de saúde, e a saúde bucal e suas dimensões funcionais e psicológicas têm sido cada vez mais apontadas como uma parte integrante da saúde geral e do bem-estar dos indivíduos (GLICK et al., 2016; HARALDSTAD et al. 2019). De acordo com a Federação Dentária Internacional (FDI), a saúde bucal é multifacetada e influenciada de forma contínua pelos valores e atitudes das pessoas e das comunidades e reflete os atributos fisiológicos, sociais e psicológicos essenciais à qualidade de vida (GLICK et al., 2016).

Nesse contexto, a qualidade de vida relacionada à saúde bucal (QVRSB) tem sido amplamente preconizada como um adjunto aos parâmetros clínicos no planejamento de políticas públicas e na avaliação de estratégias de saúde bucal (SISCHO; BRODER, 2011). A QVRSB é definida como um constructo multidimensional, o qual se refere à extensão com que as injúrias bucais afetam as funções diárias e o bem-estar dos indivíduos (LOCKER; ALLEN, 2007). A avaliação subjetiva da QVRSB reflete o conforto das pessoas ao comer, dormir e se envolver em interações sociais, sua autoestima e sua satisfação com relação à sua saúde bucal (GROUP, 1995). Assim, a saúde bucal emerge como um conceito positivo que destaca os recursos pessoais e sociais disponíveis aos indivíduos, como por exemplo, o capital social.

O capital social tem sido associado a diferentes aspectos de saúde e de doença (MOORE; KAWACHI, 2017). Em relação à saúde bucal, foi demonstrado que indivíduos com altos níveis de capital social apresentaram menor experiência de cárie e gengivite, assim como um menor número de dentes perdidos (FONTANINI; MARSHMAN; VETTORE, 2015; TOMAZONI et al., 2017; SFREDDO et al. 2019), além de apresentarem melhores comportamentos e atitudes em relação à sua saúde bucal (BURR; LEE, 2012; QIU et al. 2016). A literatura também tem demonstrado que as redes sociais e o suporte social individual e comunitário estão relacionadas com medidas subjetivas de saúde, particularmente em relação à capacidade da pessoa de lidar com a doença ou com uma saúde precária (GUPTA et al. 2015). Assim, foi demonstrado que níveis elevados de capital social estão relacionados a uma melhor autopercepção de saúde e maior QVRSB (LAMARCA et al. 2013; ROUXEL et al. 2015; KNORST et al. 2019; VETTORE et al. 2019).

O Quadro 1 resume alguns estudos que avaliaram a associação entre diferentes indicadores de capital social com condições normativas e subjetivas de saúde bucal. As principais características destacadas envolvem a descrição do estudo, desenho, amostra, variáveis utilizadas, análise estatística e principais achados. A base de dados utilizada foi o PubMed (até junho de 2022) e, também, houve seleção a partir da lista de referências dos artigos selecionados. A combinação dos termos originou a estratégia de busca a seguir:

> “((((((((((((((((((((("oral health"[MeSH Terms]) OR "oral health") OR "oral diseases" OR "oral health related quality of life") OR "ohrqol" OR “dental caries” OR “gingival bleeding” OR “tooth loss”))))) AND ((((((((((((("social capital"[MeSH Terms]) OR "social capital") OR "social networks") OR "social support") OR "social relationships")))))) AND ((((((((((((((((("prevalence"[MeSH Terms]) OR "prevalence") OR "incidence"[MeSH Terms]) OR "incidence") OR "cross sectional studies"[MeSH Terms]) OR "cross sectional") OR "cohort studies"[MeSH Terms]) OR "cohort") OR "longitudinal studies")))))”

No total, 241 artigos foram encontrados. Os critérios de seleção dos artigos foram: estudos de coorte ou transversais em crianças ou adolescentes e que incluíram desfechos normativos e/ou subjetivos de saúde bucal (cárie dentária, gengivite, periodontite, autopercepção de saúde bucal, QVRSB, hábitos relacionados a saúde bucal, etc.) e variáveis preditoras relacionadas ao capital social em análises ajustadas. Estudos envolvendo populações de risco ou indivíduos com doenças sistêmicas foram excluídos. Os estudos considerados relevantes pela autora foram incluídos nessa breve revisão narrativa de literatura.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continua)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Dalla-Nora et al. (2022) Brasil.	*"Self-perceived neighborhood factors and OHRQoL among adolescents: a population-based study in southern Brazil."*	Transversal.	1.197 adolescentes entre 15 e 19 anos de idade em escolas públicas e privadas localizadas na cidade de Santa Maria.	Desfecho: QVRSB avaliada através do questionário *Oral Health Impact Profile* (OHIP-14). Preditores: variáveis clínicas, demográficas e socioeconômicas e variáveis comunitárias (centros comunitários, centros religiosos, pavimentação, água encanada).	Modelo multinível de regressão de Poisson com abordagem hierárquica.	Indivíduos que moravam em comunidades sem pavimentação nas ruas e sem água encanada apresentaram pior QVRSB. O baixo nível socioeconômico, baixa frequência de escovação e alto consumo de açúcar também foram associados a uma pior QVRSB. A presença de centros comunitários e religiosos no bairro não foram associadas aos escores do OHIP-14.
Amin et al. (2021) Canadá.	*"Perceived social support and discrimination and oral health behaviors in adolescents".*	Transversal.	252 adolescentes entre 12-18 anos atendidos na clínica da Universidade de Alberta.	Desfecho: frequências de ingestão de açúcar e escovação, utilização e padrão do uso de serviços odontológicos. Preditores: suporte social, autopercepção de discriminação racial, variáveis demográficas e socioeconômicas.	Regressão logística e análise de moderação.	O alto apoio social percebido foi associado a uma maior frequência de escovação. O apoio social percebido pelos adolescentes afetou alguns aspectos da sua saúde bucal, mas não moderou a influência da percepção de discriminação racial.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Ferreira et al. (2021) Brasil.	*"Effect of individual and neighborhood social capital on gingival bleeding in children: A 7-year cohort study."*	Coorte.	449 crianças acompanhadas durante 7 anos na cidade de Santa Maria.	Desfecho: sangramento gengival avaliado através do índice Índice Periodontal Comunitário (IPC).[1]. Preditores: associação de classe social e número de igrejas no bairro, frequência de prática religiosa, redes de voluntários e envolvimento escolar, variáveis demográficas, socioeconômicas.	Modelo multinível de regressão de Poisson ajustado.	As crianças que viviam em áreas com maior número de igrejas no início do estudo apresentaram menor sangramento gengival após 7 anos. Em relação ao capital social individual, crianças cujos pais não frequentavam as atividades escolares apresentaram maior chance de apresentar sangramento gengival.
Fagundes et al. (2021) Brasil.	*"Factors associated with self-perceived oral health in different age groups".*	Transversal.	5.314 adolescentes entre 15-19 anos avaliados em 163 municípios do estado de São Paulo.	Desfecho: autopercepção de saúde bucal. Preditores: capital social individual, variáveis demográfica, socioeconômicas e clínicas.	Regressão de Poisson com abordagem hierárquica.	Adolescentes com baixo capital social foram mais propensos a apresentar autopercepção de saúde bucal ruim. Piores condições clínicas de saúde bucal também foram associadas a uma autopercepção de saúde bucal ruim.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	Descrição	Desenho	Amostra	Variáveis	Análise estatística	Principais achados
Santoso et al. (2021) Indonésia.	*"Lifestyle and psychosocial correlates of oral hygiene practice among Indonesian adolescents."*	Transversal.	11.142 estudantes de 11 a 18 anos avaliados na Pesquisa Global de Saúde Escolar na Indonésia em 2015.	Desfecho: frequência de escovação dentária. Preditores: variáveis demográficas e socioeconômicas, estresse psicossocial, uso de drogas e apoio dos pais e dos colegas.	Regressão Logística ajustada.	Adolescentes que tinham um baixo suporte dos colegas e dos pais foram menos propensos a escovar os dentes. Piores condições socioeconômicas e dietéticas também foram associadas a uma menor frequência de escovação.
Folayan et al. (2020) Nigéria.	*"Association between adverse childhood experiences, bullying, self-esteem, resilience, social support, caries and oral hygiene in children and adolescents in sub-urban Nigeria.".*	Transversal.	1.001 crianças entre 6-16 anos avaliadas em escolas secundárias na Nigéria.	Desfecho: cárie dentária (índice CPO-D[2]), complicações da cárie (índice PUFA[3]), e índice de higiene oral. Preditores: resiliência, auto estima, suporte social, bullying, variáveis demográficas e socioeconômicas.	Regressão Logística ajustada.	O baixo suporte social e baixo autoestima foram associados a maior presença de cárie dentária. Nenhuma variável psicossocial foi associada as complicações da cárie dentária. A baixo autoestima também foi associada a pior higiene bucal.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Silva et al. (2020) Brasil.	*"Clinical consequences of untreated dental caries, individual characteristics, and environmental factors on self-reported oral health measures in adolescents: a follow-up prevalence study."*	Coorte.	406 adolescentes de 12 anos avaliados em escolas públicas de Manaus.	Desfecho: QVRSB avaliada através do *Child Perceptions Questionnaire* (CPQ-11-14) e autopercepção de saúde bucal. Preditores: variáveis demográficas e socioeconômicas, suporte social, senso de coerência e autoestima.	Modelagem de equações estruturais (MEE).	Status socioeconômico, fatores psicossociais e apoio social foram relacionados à QVRSB e à autopercepção da saúde bucal por vias diretas e indiretas.
Vettore et al. (2019) Brasil.	*"Socio-economic status, social support, social network, dental status, and oral health reported outcomes in adolescents."*	Transversal.	542 adolescentes entre 12 e 14 anos de idade em escolas públicas localizadas na cidade de Dourados.	Desfecho: QVRSB avaliada através do *questionário Oral Impacts on Daily Performances* (OIDP) e auto avaliação de saúde bucal. Preditores: apoio social e redes sociais, variáveis clínicas, demográficas e socioeconômicas.	Modelagem de equações estruturais (MEE).	Maior apoio social estava ligado a uma melhor condição dentária e melhor QVRSB. Ter mais redes sociais estava diretamente ligado a um melhor estado dentário. O mau estado dentário estava ligado à dor dentária e à pobre QVRSB. O apoio social e as redes sociais indiretamente predizem QVRSB e auto avaliação de saúde via estado dentário e dor dentária.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Knorst et al. (2019) Brasil.	*"Effect of neighborhood and individual social capital in early childhood on oral health-related quality of life: a 7-year cohort study."*	Coorte.	449 crianças acompanhadas durante 7 anos na cidade de Santa Maria.	Desfecho: QVRSB avaliada no acompanhamento através do *Child Perceptions Questionnaire* (CPQ8-10). Preditores: indicadores de capital social em nível individual e comunitário. Variáveis clínicas, demográficas e comportamentais.	Modelo Multinível de Regressão de Poisson ajustado.	Crianças que viviam em áreas com associações de classe social no baseline e cujos pais frequentavam as atividades escolares relataram melhor QVRSB no acompanhamento. Altos níveis de capital social individual e de bairro na primeira infância influenciaram positivamente a QVRSB de crianças.
Kumar et al. (2019) Índia.	*"Relationship between Dental Caries Experience and Social Capital among Children - A Pilot Study."*	Transversal.	186 crianças entre 5 e 12 anos avaliados em Kerala.	Desfecho: cárie dentária (índice CPO-D). Preditores: empoderamento, confiança e controle social comunitário, frequência de atividades religiosas, refeições junto a família, variáveis demográficas e socioeconômicas.	Regressão de Poisson ajustada.	O domínio controle social (ações dos familiares ou vizinhos que buscam corrigir o comportamento desviante) do capital social foi associado à experiência de cárie das crianças.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Sfreddo et al. (2019) Brasil.	*"Pathways of socioeconomic inequalities in gingival bleeding among adolescents."*	Coorte.	770 adolescentes de 14 anos de idade em escolas públicas localizadas na cidade de Santa Maria.	Desfecho: sangramento gengival no acompanhamento avaliado através do Índice Periodontal Comunitário (IPC). Preditores: religiosidade, nível socioeconômico e variáveis comportamentais.	Modelagem de equações estruturais (MEE).	A menor religiosidade dos pais como aspecto psicossocial teve um efeito direto no sangramento gengival no acompanhamento. Fatores materiais contribuíram mais para explicações sobre as desigualdades na saúde periodontal dos adolescentes. A prática religiosa como fator psicossocial explicou apenas parte da porcentagem de dentes com sangramento gengival no acompanhamento.
Tomazoni et al. (2017) Brasil.	*"The associations of socioeconomic status and social capital with gingival bleeding among schoolchildren."*	Transversal.	1.134 escolares de 12 anos de Santa Maria, uma cidade do sul do Brasil.	Desfecho: sangramento gengival através do IPC. Preditores: frequência de prática religiosa, sexo, nível socioeconômico, placa visível, apinhamento dental e variáveis contextuais.	Modelo multinível de Regressão de Poisson.	Crianças cujos pais tinham baixa escolaridade, crianças que tiveram placa dental e apinhamento dentário, e que nunca/quase nunca compareceram a reuniões religiosas exibiram níveis significativamente mais altos de sangramento gengival.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Qiu et al. (2016) China.	*"The relationship between children's oral health-related behaviors and their caregiver's social support."*	Transversal.	1.332 crianças de 5 anos de idade e seus cuidadores em Guangzhou, sul da China.	Desfecho: frequências de ingestão de açúcar e escovação, utilização e padrão do uso de serviços odontológicos. Preditores: apoio social, cárie dentária, sexo, educação e ocupação dos pais.	Regressão Logística ajustada.	Não foi encontrada associação entre o apoio social do cuidador e os comportamentos relacionados à saúde bucal da criança. Variáveis relacionadas aos comportamentos de saúde bucal do cuidador foram associadas aos comportamentos relacionados à saúde bucal da criança.
Silva et al. (2015) Brasil.	*"The Association between Participation of Adolescents in Community Groups and Dental Caries in a Deprived Area in Brazil."*	Transversal.	200 adolescentes entre 15 e 19 anos moradores de uma área carente no estado do Amazonas, Brasil.	Desfecho: experiência de cárie; cárie atual; dentes ausentes devido à cárie avaliados através do índice CPO-D e o índice de cuidado. Preditores: participação em grupos comunitários, dados socioeconômicos, demográficos e de uso de serviços.	Regressão de Poisson ajustada.	A participação em grupos comunitários foi estatisticamente associada ao menor escore de CPOD, menor número de dentes cariados e perdidos e ao maior índice de cuidado. A participação de adolescentes em atividades comunitárias foi relacionada a níveis mais baixos de cárie dentária.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	Descrição	Desenho	Amostra	Variáveis	Análise estatística	Principais achados
Reynolds et al. (2015) Estados Unidos.	*"Neighborhood and family social capital and parent-reported oral health of children in Iowa."*	Transversal.	2.186 crianças avaliadas em domicílios em Iowa, Estados Unidos.	Desfecho: saúde bucal da criança relatada pelos pais. Preditores: capital social individual e comunitário.	Regressão Linear ajustada.	Foram encontradas associações positivas significativas entre o estado de saúde bucal da criança e o capital social da vizinhança e de indicadores do capital social familiar (frequência familiar de refeições juntos). Os achados indicam que a saúde bucal das crianças pode ser influenciada por fatores sociais amplos, como o capital social da vizinhança e da família.
Fontanini et al. (2015) Brasil.	*"Social support and social network as intermediary social determinants of dental caries in adolescents."*	Transversal.	542 adolescentes entre 12 e 14 anos de idade em escolas públicas localizadas na cidade de Dourados, Brasil.	Desfecho: experiência de cárie (CPO-D ≥ 1) e cárie dentária atual (componente D de CPO-D ≥ 1). Preditores: suporte social, redes sociais, condições socioeconômicas e sistema de saúde.	Regressão de Poisson ajustada utilizando uma abordagem hierárquica.	Adolescentes com baixo número de redes sociais e baixos níveis de apoio social da família tinham maior probabilidade de ter CPO-D≥1. A cárie dentária atual foi associada a baixo número de redes sociais e baixos níveis de apoio social familiar. O apoio social e as redes sociais foram fatores psicossociais influentes para a cárie dentária em adolescentes.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Santiago et al. (2014) Brasil.	*"The relationship between neighborhood empowerment and dental caries experience: a multilevel study in adolescents and adults."*	Transversal.	573 indivíduos de 15 a 19 anos e de 35 a 44 anos de idade, oriundos de 30 setores censitários de três municípios da Paraíba, Brasil.	Desfecho: experiência de cárie (CPO-D). Preditores: fatores demográficos, socioeconômicos e comportamentais, uso de serviços odontológicos e medidas de capital social.	Modelos multiníveis de Regressão Logística.	A alta experiência de cárie foi inversamente associada ao "empoderamento" da vizinhança. O capital social individual não foi associado à experiência de cárie. A associação entre o "empoderamento" de vizinhança e a experiência de cárie sugere que a percepção das características do local de residência deve ser levada em conta nas ações de promoção de saúde bucal.
Guedes et al. (2014) Brasil.	*"Assessing individual and neighborhood social factors in child oral health-related quality of life: a multilevel analysis."*	Transversal.	478 crianças de 1 a 5 anos de idade avaliadas no dia da campanha nacional de multivacinação infantil em Santa Maria, sul do Brasil.	Desfecho: QVRSB avaliada através do *Early Childhood Oral Health Impact Scale* (ECOHIS). Preditores: capital social individual e comunitário, variáveis socioeconômicas e clínicas.	Modelos multiníveis de Regressão de Poisson.	Visitar vizinhos menos de uma vez por mês, presença de mordida aberta anterior, traumatismo dentário e cárie dentária foram associados a uma pior QVRSB. No nível contextual, a presença de centros culturais comunitários no bairro estava associada a menores escores no ECOHIS. Existe uma associação significativa entre os determinantes sociais individuais e contextuais na QVRSB.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Duijster et al. (2014) Holanda.	*"Modelling community, family, and individual determinants of childhood dental caries."*	Transversal.	630 crianças de 6 anos na Holanda.	Desfecho: experiência de cárie (CPO-D). Preditores: suporte social, condições socioeconômicas e hábitos de higiene bucal.	Modelagem de equações estruturais (MEE).	O menor nível de escolaridade materna e menor qualidade de vizinhança estiveram diretamente associados a níveis mais altos de cárie em crianças.
Iida et al. (2013) Estados Unidos.	*"Mother-perceived social capital and children's oral health and use of dental care in the United States."*	Transversal.	67.388 crianças cujas mães participaram da Pesquisa Nacional de Saúde Infantil de 2007 nos Estados Unidos.	Desfecho: saúde bucal, necessidades de cuidados odontológicos e consulta odontológica preventiva no ano anterior. Preditores: capital social (apoio e confiança na vizinhança).	Regressão Logística ajustada.	Crianças cujas mães possuíam um capital social mais baixo foram mais propensas a abandonar as consultas odontológicas preventivas. Mães com menor capital social foram mais propensas a relatar necessidades de cuidados dentários para seus filhos. Uma melhor compreensão dos efeitos do capital social sobre os riscos à saúde bucal das crianças pode ajudar a abordar as disparidades de saúde bucal.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Santiago et al. (2013) Brasil.	*"Social capital and dental pain in Brazilian northeast: a multilevel cross-sectional study."*	Transversal.	624 indivíduos de 3 faixas etárias: 15-19, 35-44 e 65-74 anos, selecionados aleatoriamente e em 30 setores censitários no Estado da Paraíba.	Desfecho: presença de dor dentária nos últimos 6 meses. Preditores: fatores demográficos, socioeconômicos, uso de serviços odontológicos, auto percepção de saúde bucal e medidas de capital social (individuais e contextuais).	Modelos multiníveis de Regressão Logística.	Indivíduos residentes em bairros com alto capital social tiveram menos chance de relatar dor dentária. O capital social de ligação (interação positiva) foi independentemente associado com a dor dentária. Os achados sugerem que o capital social contextual e individual são independentemente associados à dor dentária.
Furuta et al. (2012) Japão.	*"Social capital and self-rated oral health among young people."*	Transversal.	967 estudantes da Universidade de Okayama, com idades entre 18 e 19 anos.	Desfecho: auto percepção de saúde bucal. Preditores: gênero, percepções de capital social, renda familiar e comportamentos de saúde bucal (frequência de escovação e uso de fio dental).	Regressão Logística ajustada.	A baixa confiança na vizinhança e na escola foi associada a uma pior auto percepção de saúde bucal. O baixo controle social informal foi associado a uma melhor auto percepção de saúde bucal.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(continuação)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Bernabé et al. (2011) Inglaterra.	*"Roles of different sources of social support on caries experience and caries increment in adolescents of East London."*	Coorte.	886 adolescentes de 15 a 16 anos participantes de um estudo prospectivo de base escolar no leste de Londres.	Desfecho: incremento de cárie no acompanhamento (índice CPO-D). Preditores: fatores demográficos, socioeconômicos, comportamentais e suporte social.	Regressão de Poisson ajustada.	O apoio social foi negativamente relacionado à experiência de cárie, independente das demais características. Os adolescentes que perceberam níveis mais altos de apoio social tiveram menor experiência e incremento de cárie. O apoio de uma pessoa especial foi mais relevante para os adolescentes do que o apoio da família e dos colegas.
Aida et al. (2008) Japão.	*"Contributions of social context to inequality in dental caries: a multilevel analysis of Japanese 3-year-old children."*	Transversal.	3.086 crianças avaliadas em 44 municípios no Japão.	Desfecho: cárie dentária (índice CPO-D). Preditores: centros culturais comunitários e associações de trabalhadores no bairro, variáveis demográficas e socioeconômicas.	Modelos multiníveis de Regressão Linear.	A presença de centros culturais comunitários no bairro foi associada a uma menor experiência de cárie nas crianças.

Quadro 1 – Estudos sobre capital social e condições de saúde bucal

(conclusão)

Autores e local	**Descrição**	**Desenho**	**Amostra**	**Variáveis**	**Análise estatística**	**Principais achados**
Patussi et al. (2007) Brasil.	*"The potential impact of neighborhood empowerment on dental caries among adolescents."*	Transversal.	1.302 adolescentes de 14 a 15 anos avaliados em 39 escolas públicas no Distrito Federal.	Desfecho: cárie dentária (índice CPO-D). Preditores: empoderamento na vizinhança e fatores demográficose socioeconômicos.	Modelo multinível de Regressão de Logística ajustada.	Adolescentes que residiam em áreas com maior empoderamento foram menos propensos a apresentar cárie dentária.

[1] O Índice Periodontal Comunitário (*Community Periodontal Index*, CPI) é o exame preconizado pela Organização Mundial da Saúde (OMS) para avaliação periodontal em levantamentos epidemiológicos (WORLD HEALTH ORGANIZATION, 2013). O CPI contempla três indicadores da condição periodontal: sangramento gengival, presença de cálculo dental e bolsas periodontais. A codificação do IPC compreende: 0 – saudável; 1 – sangramento à sondagem; 2 – presença de cálculo; 3 – bolsas de 4-5mm; 4 – bolsas ≥6mm; X – sextante excluído (menos de 2 dentes presentes); 9 – não reportado.

[2] O Índice CPO-D (DMF-T *index*) mensura o número de dentes cariados perdidos e obturados e é o exame preconizado pela OMS para avaliação da história presente e passada de cárie em levantamentos epidemiológicos (WORLD HEALTH ORGANIZATION, 2013). O CPO-D contempla três componentes: dentes cariados – C; dentes perdidos – P; dentes obturados – O.

[3] O índice PUFA/pufa (PUFA/pufa *index*) avalia a presença de condições clínicas odontológicas resultantes de cárie dentária não tratada, incluindo a presença de polpa visível, ulceração da mucosa oral devido a fragmentos de raiz, fístula ou abscesso. A codificação compreende: envolvimento pulpar – P; ulceração – U; fístula – F; abcesso – A.

Fonte: Autora.

1.2 JUSTIFICATIVA

As iniquidades em saúde bucal são consideradas um problema de saúde pública e são determinadas por uma série de fatores individuais e contextuais (WILLIAMS, 2011; PERES et al. 2019). Dentre esses fatores, encontra-se o capital social, destacado como um dos principais determinantes de saúde na estrutura conceitual dos determinantes sociais da OMS (SOLAR; IRWIN, 2010). Um número crescente de estudos sugere que níveis elevados de capital social beneficiam a saúde bucal, entretanto, a maioria são de cunho transversal e em população adulta. Além disso, as vias teóricas pelas quais o capital social influencia na saúde bucal, bem como os indicadores mais utilizados ainda não foram muito explorados. Em adição, estudos prévios ressaltaram que identificar um fator causal conhecido sem levar em conta os caminhos sociais com os quais esse fator se relaciona pode ser ineficaz (NEWTON; BOWER, 2005). Assim, estudar possíveis fatores modificadores do efeito do capital social na saúde bucal, bem como identificar os períodos etários mais cruciais em torno dessa condição pode ser útil em termos de saúde pública.

Estudar esses fatores em uma população infantil é de extrema importância, visto que essa faixa etária se encontra vulnerável a diversos fatores de risco à saúde, os quais não permanecem apenas na infância, mas podem persistir ao longo do curso de vida (HOLST; SCHULLER, 2012; SILVEIRA et al., 2014; STRAATMANN et al., 2019). Além disso, a AAPD tem apoiado a realização de pesquisas adicionais para entender os mecanismos subjacentes aos determinantes sociais da saúde bucal durante a infância (AMERICAN ACADEMY OF PEDIATRIC DENTISTRY, 2017). Portanto, a avaliação longitudinal de desfechos normativos e subjetivos na transição da infância para a adolescência permite compreender os determinantes e os caminhos causais do processo saúde-doença durante um importante período de desenvolvimento biopsicossocial. Desse modo, ações sobre os determinantes sociais podem ser planejadas e implementadas em termos de saúde pública.

1.3 PROPOSIÇÃO

Essa tese tem como objetivo geral avaliar o impacto do capital social nas condições de saúde bucal normativas e subjetivas de crianças e adolescentes. Também foram estruturados quatro objetivos específicos, explorados detalhadamente em cada um dos artigos:

a) avaliar sistematicamente a associação do capital social individual e comunitário com diferentes desfechos de saúde bucal em crianças e adolescentes;

b) explorar as vias pelas quais o capital social pode influenciar na cárie e na QVRSB de crianças ao longo do tempo, avaliando os efeitos diretos e indiretos de variáveis psicossociais e comportamentais;

c) avaliar o efeito moderador do SDC na relação entre capital social e QVRSB em adolescentes;

d) verificar o impacto do capital social individual e comunitário na primeira infância na QVRSB em diferentes idades ao longo de 10 anos de acompanhamento.

1.4 HIPÓTESES CONCEITUAIS

As hipóteses conceituais dessa tese foram testadas de acordo com modelos conceituais previamente descritos na literatura de capital social e saúde bucal (SOLAR; IRWIN, 2010; ROUXEL et al. 2015). A hipótese geral da tese é que o alto capital social impacta positivamente em desfechos normativos e subjetivos de saúde bucal de crianças e adolescentes. As hipóteses conforme os objetivos específicos, estão descritas abaixo:

a) o alto capital social em nível individual e comunitário impacta positivamente em condições normativas e subjetivas de saúde bucal em crianças e adolescentes.

b) o capital social individual e comunitário na primeira infância pode ter um efeito direto – o alto capital social pode predizer menos cárie dentária e melhor QVRSB em 10 anos de acompanhamento; e indireto – o impacto do capital social sobre a cárie dentária e a QVRSB ao longo do tempo pode ser mediado por vias psicossociais, comportamentais e de acesso aos serviços odontológicos.

c) o impacto do baixo capital social na QVRSB de adolescentes pode ser influenciado pelo nível de SDC – indivíduos com baixo capital social e alto SDC apresentam melhor QVRSB do que aqueles com baixo capital social e baixo SDC.

d) altos níveis de capital social individual e comunitário na primeira infância impactam positivamente a QVRSB ao longo dos períodos de acompanhamento.

2 MATERIAIS E MÉTODOS

Esta sessão apresenta a metodologia expandida dessa tese.

2.1 REVISÃO SISTEMÁTICA

Essa revisão sistemática foi realizada de acordo com as diretrizes do Cochrane Handbook (HIGGINS, 2011). Além disso, um protocolo de revisão foi registrado no *International Prospective Register of Systematic Reviews* (PROSPERO; número do protocolo: CRD42019138197).

2.1.1 Questão de pesquisa e buscas

A questão de pesquisa da revisão foi "O capital social influencia em desfechos de saúde bucal em crianças e adolescentes?". Para isso, foi utilizada a seguinte estratégia PECO: População (P): crianças e adolescentes; exposição (E): baixo capital social; comparação (C): alto capital social; e desfecho '*outcome*' (O): medidas clínicas e subjetivas de saúde bucal avaliadas por meio de métodos válidos.

Foram realizadas buscas eletrônicas nas bases de dados PUBMED, SCOPUS, EMBASE, ISI Web of Science para verificar os artigos publicados até junho de 2021. A lista de referência de todos os artigos de interesse também foi verificada para pesquisas adicionais. A busca foi realizada utilizando uma combinação de vocabulário controlado e palavras-chave, incluindo diferentes conceitos e medidas de capital social e resultados de saúde bucal. Os principais termos utilizados foram: capital social; rede social; suporte social; confiança social; relacionamento social; saúde bucal; doença bucal; cárie dentária; dor de dente; gengivite; sangramento gengival; doença periodontal; periodontite; impacto oral; qualidade de vida relacionada à saúde bucal; autopercepção da saúde bucal; saúde bucal subjetiva; criança; adolescente; pré-escolar; e escolares.

Dois revisores (JKK e FT) avaliaram os artigos de forma independente. Num primeiro momento (fase 1), foram examinados os títulos e resumos para triagem dos artigos elegíveis para leitura de texto completo. Posteriormente, os artigos incluídos para leitura completa foram criticamente analisados (fase 2).

Para ambas as fases, foram adotados os seguintes critérios de inclusão: (1) estudos observacionais transversais e de coorte (prospectivos e retrospectivos) que avaliaram a

associação entre capital social e desfechos em saúde bucal; (2) estudos avaliando o capital social em nível individual e/ou contextual por meio de indicadores válidos ou proxies; (3) estudos que avaliaram a saúde bucal por meio de métodos validados objetivos ou subjetivos; (4) estudos incluindo crianças e/ou adolescentes. Não foram aplicadas restrições de idioma e ano de publicação. Foram excluídos estudos envolvendo indivíduos com fissuras orais, distúrbios psicomotores, indígenas ou gestantes.

As discordâncias entre os revisores foram resolvidas por discussão. Qualquer desacordo persistente foi decidido por opinião de um terceiro revisor (CSS). A confiabilidade entre os revisores foi testada em 10% dos trabalhos durante o processo de seleção. Os coeficientes Kappa para a concordância entre os revisores foram excelentes, sendo de 0,97 para títulos e resumos (fase 1) e 1,00 para os textos completos (fase 2).

2.1.2 Extração de dados e avaliação do risco de viés

Os dois revisores (JKK e FT) coletaram independentemente os seguintes dados dos estudos incluídos: autores; país; ano de publicação; desenho do estudo e duração; população estudada e idade; tamanho da amostra; desfecho de saúde bucal; variável de capital social (individual e/ou contextual) e informação sobre risco de viés.

A qualidade metodológica dos estudos incluídos foi avaliada através da *Newcastle Ottawa Scale* (NOS) adaptada para estudos transversais (PETERSON et al. 2011). A NOS avalia a qualidade metodológica de estudos primários usando um sistema de estrelas de acordo com três categorias: (1) seleção dos indivíduos (até quatro estrelas); (2) comparabilidade entre os grupos de estudo (até duas estrelas) e (3) avaliação do desfecho (até três estrelas). Posteriormente, cada estudo foi classificado de acordo com o risco de viés: alto (0-3 estrelas); médio (4-6 estrelas); ou baixo (7 ou mais estrelas) (LO et al. 2014).

2.1.3 Síntese de dados e variáveis

A síntese e compilação dos dados foram guiadas de acordo com as variáveis e fatores disponíveis nos estudos incluídos. Foram coletadas as estimativas da associação entre capital social e diferentes desfechos de saúde bucal considerados nos estudos primários. Todos os indicadores ou *proxies* de capital social individual e contextual foram considerados elegíveis. Desse modo, mais de um indicador de capital social por estudo foi extraído quando possível.

Foram realizadas metanálises gerais separadas de acordo com o nível de capital social (individual e contextual); e tipo de desfecho de saúde bucal, unidos por similaridade: a) medida de saúde bucal clínica (cárie dentária e sangramento gengival) e b) medida de saúde bucal subjetiva (QVRSB e auto percepção de saúde bucal). Também foram realizadas metanálises de subgrupos considerando cada desfecho separadamente (cárie dentária, sangramento gengival, QVRSB e auto percepção de saúde bucal), desenho do estudo (transversal e coorte), faixa etária (crianças, adolescentes e ambos) e indicadores específicos de capital social, como controle social, redes sociais (visitar amigos e vizinhos, prática religiosa, envolvimento escolar, número de trabalhadores ou entidades na comunidade), apoio social (de amigos, da escola, da família ou vizinhança) e confiança social (sentimentos de pertencimento, segurança ou confiança nas pessoas ou na comunidade em geral). As estimativas agrupadas foram obtidas para indicar a seguinte associação entre capital social e saúde bucal: quanto menor o capital social, pior a condição de saúde bucal.

Alguns fatores foram coletados como potenciais fontes de heterogeneidade entre os estudos selecionados, como risco de viés (médio ou baixo), tipo de análise do estudo primário (ajustado ou bruto), instrumento ou índice utilizado para avaliar o desfecho de saúde bucal (tipo de questionário ou índice, por exemplo, CPQ11-14 ou índice CPO-D), classificação econômica do país, agrupado em países de renda alta, média-alta, média-baixa ou baixa (THE WORKD BANK GROUP, 2021), e faixa etária: crianças (até 11 anos), adolescentes (12 a 19 anos) (WORLD HEALTH ORGANIZATION, 2013), ou ambos.

2.1.4 Análises de dados

A metanálise e a metaregressão do artigo 1 foram realizadas usando o software estatístico R (versão 3.6.1). Os desfechos de saúde bucal considerados foram cárie dentária, sangramento gengival, QVRSB e auto percepção de saúde bucal, medidos por meio de instrumentos validados e representados por escores gerais, médias, prevalência de impacto de gravidade. A metanálise foi realizada para obter estimativas agrupadas usando um modelo de efeitos aleatórios. As medidas dos estudos primários com dados disponíveis foram convertidas em log-binomial e posteriormente transformadas em razão de prevalência (RP) com respectivos intervalos de confiança (IC) de 95% (RICHARDSON et al. 2015).

Foi realizada uma metanálise global de acordo com o nível individual e contextual de capital social e de desfechos de saúde bucal clínicos e subjetivos. A metanálise de subgrupos foi realizada considerando resultados específicos de saúde bucal, desenho do estudo, faixa etária

e indicador de capital social. A heterogeneidade foi examinada usando a estatística I^2 (HIGGINS, 2011). As fontes potenciais de modificação de efeito e heterogeneidade na metanálise geral foram avaliadas por meio de análise de metaregressão de acordo com o desenho do estudo, instrumento de avaliação do desfecho, indicador de capital social, risco de viés, tipo de análise do estudo primário, faixa etária e classificação econômica do país.

2.2 ESTUDO DE COORTE

2.2.1 Delineamento

Esta pesquisa corresponde a um estudo longitudinal, no qual se propôs uma quarta etapa de avaliação dos indivíduos que compõe a amostra, totalizando 10 anos de acompanhamento (Figura 6). O ponto inicial foi um levantamento epidemiológico de saúde bucal, de caráter transversal, realizado em 2010. A metodologia empregada e os resultados obtidos já foram publicados em estudos prévios (PIOVESAN et al. 2012; GUEDES et al 2016; KNORST et al. 2019).

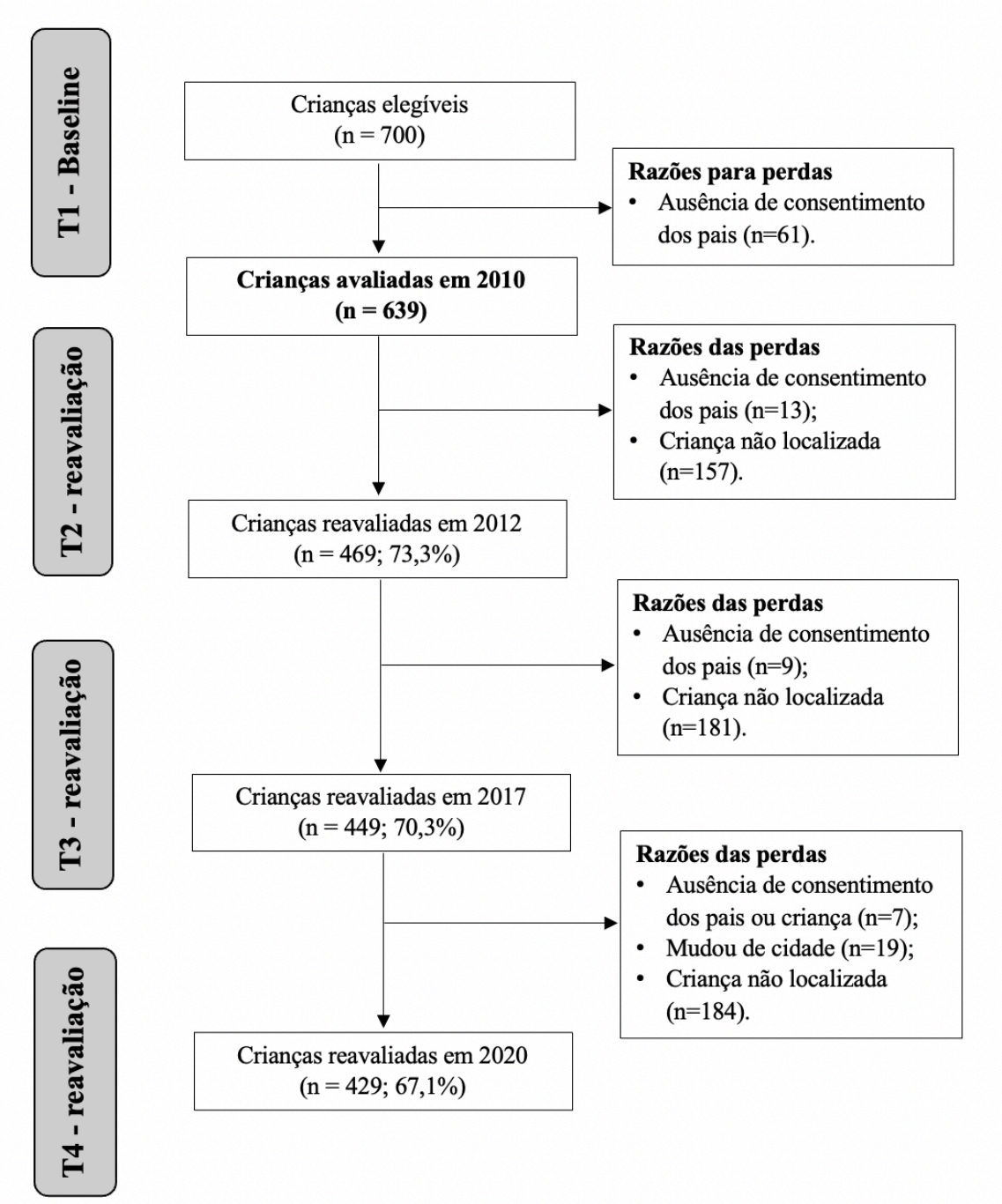
2.2.2 Caracterização da amostra

2.2.2.1 Levantamento epidemiológico (baseline)

Um levantamento epidemiológico (T1) foi realizado com crianças de 1 a 5 anos na cidade de Santa Maria no ano de 2010. Neste período, a cidade tinha uma população estimada de 263.403 habitantes, que incluía 27.520 crianças com idade inferior a 6 anos. Uma amostra probabilística sistemática foi selecionada entre todas as crianças que frequentaram as unidades básicas de saúde (UBS) no município no Dia Nacional de Multivacinação Infantil. Os pontos de amostragem incluíram 15 centros de saúde que continham cadeira odontológica, os quais estavam distribuídos em diferentes bairros da cidade. No momento do estudo, 15 equipes compostas por um examinador, um anotador e um entrevistador foram previamente treinadas, calibradas e distribuídas nas diferentes UBS.

Um total de 639 crianças com idade entre 1 e 5 anos e cujos pais/responsáveis assinaram o termo de consentimento livre e esclarecido (TCLE), foram examinadas. Detalhes completos sobre a metodologia utilizada no T1 já foram publicados (PIOVESAN et al. 2012).

Figura 6 – Fluxograma da coorte



Fonte: Autora.

2.2.2.2 Acompanhamento de 2 anos

A segunda avaliação (T2) ocorreu no ano de 2012, aproximadamente dois anos após a primeira coleta de dados. Todas as crianças avaliadas no T1 foram consideradas elegíveis e convidadas a participar. As crianças autorizadas pelos pais/responsáveis, através da assinatura

de um novo TCLE, foram reexaminadas nos anos de 2012, quando estavam com idade entre 3 a 7 anos.

Algumas estratégias foram adotadas para retomar o contato com as famílias dos participantes e minimizar as perdas de acompanhamento. Em um primeiro momento, foram feitas ligações telefônicas a partir dos números registrados no questionário semiestruturado aplicado no T1. Uma segunda tentativa consistiu no envio de cartas aos endereços dos familiares. Por fim, visitas domiciliares foram realizadas. Um total de 469 crianças foram reavaliadas, resultando em uma taxa de resposta de 73,3%. Outros detalhes, assim como os resultados do T2, já foram publicados previamente (GUEDES et al., 2016).

2.2.2.3 Acompanhamento de 7 anos

Na terceira etapa de avaliações (T3), totalizando sete anos de acompanhamento, o planejamento amostral teve como base todas as crianças avaliadas no T1. As crianças autorizadas pelos pais/responsáveis, através da assinatura de um novo TCLE, foram reexaminadas nos anos de 2017, quando estavam com idade entre 8 a 12 anos.

Uma primeira tentativa de contato foi realizada através de ligações telefônicas para a família das crianças. Outra alternativa de busca foi através da aquisição de listagens de alunos matriculados nas escolas públicas de ensino fundamental da cidade de Santa Maria, RS, obtida com o apoio da Central de Matrículas do município. Por fim, da mesma forma que as buscas conduzidas no T2, os pesquisadores realizaram visitas domiciliares, utilizando os endereços registrados nos questionários. Um total de 449 crianças foram reavaliadas, resultando em uma taxa de resposta de 70,3%. Outros detalhes, assim como os resultados do T3, já foram publicados previamente (KNORST et al., 2019).

2.2.2.4 Acompanhamento de 10 anos

O planejamento amostral da quarta etapa (T4) de avaliação teve como base todos os indivíduos avaliados no T1 (n=639), que possuíam idade de 11 a 15 anos, já sendo considerados adolescentes. Para o cálculo do tamanho da amostra, considerou-se um erro padrão de 5%, nível de confiança de 95% e prevalência de 43,8 % de cárie dentária em adolescentes no grupo exposto (baixo suporte social) e 19,5% no grupo não exposto (alto suporte social) (FONTANINI; MARSHMAN; VETTORE, 2015). A proporção entre não expostos e expostos foi de 2:1 e o poder estatístico de 90%. Considerando um efeito do desenho de 1,4 e adicionando

30% para possíveis perdas, o tamanho mínimo da amostra necessário é de 320 crianças. O cálculo amostral específico para cada questão de pesquisa dessa tese está contido dentro de cada artigo apresentado.

A coleta de dados do T4 iniciou em novembro de 2019 através de visitas nas respectivas escolas e nos domicílios dos adolescentes incluídos da amostra. No entanto, devido ao cenário de pandemia de COVID-19 decretado pela Organização Mundial da Saúde (OMS) (WORLD HEALTH ORGANIZATION, 2020), as coletas foram suspensas em março de 2020. Posteriormente, adotando todas as medidas de biossegurança cabíveis, a coleta de dados foi retomada em outubro de 2020 e finalizada em janeiro de 2021. Nesse momento, os pesquisadores realizaram apenas visitas domiciliares utilizando os endereços registrados nos questionários para realizar a avaliação, uma vez que as aulas escolares presenciais estavam suspensas. Quando necessário, os adolescentes e suas famílias eram contatados através das redes sociais, como Facebook e WhatsApp.

Após localização dos escolares e dos pais/responsáveis, todos eles foram convidados a participar de mais uma etapa do estudo, assinar os termos e a responder aos questionários. Além disso, examinadores previamente calibrados conduziram os exames para o registro de variáveis clínicas. Um total de 429 adolescentes foram reavaliadas, resultando em uma taxa de resposta de 67,1%.

2.2.3 Variáveis e instrumentos para a coleta de dados

Assim como nos três primeiros levantamentos (T1, T2 e T3), questões referentes aos fatores demográficos, socioeconômicos, comportamentais e psicossociais também foram obtidas no T4, através de um questionário estruturado aplicado aos pais/responsáveis e aos escolares. Para fins de entendimento, as variáveis e instrumentos serão identificados conforme o tempo/levantamento em que foram avaliados em geral (T1, T2, T3 ou T4). Posteriores categorizações e descrições específicas de cada variável estão contidas dentro dos artigos dessa tese.

2.2.3.1 Questionário demográfico e socioeconômico

Dados referentes ao sexo, idade, raça e condições socioeconômicas foram mensurados ao longo das avaliações da coorte. Para a classificação de raça/etnia, foram adotados os critérios estabelecidos pelo Instituto Brasileiro de Geografia e Estatística (IBGE) utilizados em

levantamentos de base populacional (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2010), utilizando a seguinte pergunta: “Você considera seu filho da raça?” (T1 e T2) ou “Você se considera de que raça?” (T3 e T4), com as opções de resposta: (1) branco; (2) pardo; (3) preto; (4) amarelo ou (5) indígena?”. Com relação às condições socioeconômicas individuais, a renda familiar foi coletada através da média do rendimento familiar no último mês (soma dos salários, pensões, auxílios do governo, etc.). A escolaridade da mãe foi avaliada com base nos anos de ensino formal completos. Questões referentes à aglomeração e estrutura familiar também foram coletadas (Apêndice A).

2.2.3.2 Questionário comportamental

Nesta pesquisa, também foram observados os comportamentos dos indivíduos em relação ao uso de serviços odontológicos e hábitos de higiene (Apêndice A).

O uso de serviços odontológicos foi avaliado através das seguintes perguntas: “No último ano (12 meses), quantas vezes você foi ao dentista?” (1) Nenhuma vez, (2) 1 vez, (3) 2 vezes, (4) 3 vezes; “Qual foi o motivo da última consulta?”; e “Qual foi o tipo de serviço procurado”, respectivamente. Quanto ao motivo da consulta, as opções de resposta foram (1) dor de dente, (2) dor na boca, (3) batida ou queda, (4) exame de rotina, (5) aparelho ou (6) outro, e quanto ao tipo de serviço procurado, as opções de resposta foram (1) serviço público ou (2) serviço privado. Também foi questionada a frequência de escovação e o uso de fio dental.

2.2.3.3 Capital social individual e comunitário

Características relacionadas ao capital social individual e comunitário foram avaliadas no T1. No T4, variáveis de capital social em nível individual também foram avaliadas.

Para avaliar o capital social individual no T1, foram obtidas informações referentes as redes sociais e de apoio através das seguintes questões: “Você pratica alguma atividade religiosa?” (1) sim ou (2) não; “Com que frequência você pratica atividades religiosas” (1) todos os dias ou quase todos os dias; (2) uma vez na semana, (3) uma vez ao mês, (4) uma vez a cada 3 meses, e (5) nunca ou quase nunca; “Nos últimos 12 meses com que frequência você visitou alguém da família ou alguém da família visitou você?” (1) sim, mais de uma vez por mês, (2) sim, pelo menos uma vez por mês, (3) sim, menos de uma vez por mês, (4) nunca ou quase nunca. As mesmas opções de resposta foram obtidas em relação a visita a amigos ou vizinhos. Além disso, foram obtidas informações a respeito da participação em grupos

voluntários e nas atividades escolares do filho (Apêndice B). Estas questões são comumente utilizadas na literatura sobre capital social, inclusive na população brasileira (HYYPPÄ; MAKI, 2001; PATUSSI; HARDY; SHEIHAM, 2006; TOMAZONI et al., 2017).

No T4, o capital social individual foi avaliado através de questões comumente utilizadas e reportadas previamente na literatura (HYYPPÄ; MAKI, 2001; PATUSSI; HARDY; SHEIHAM, 2006; HARPHAM; GRANT; THOMAS, 2002; STORY et al., 2015), considerando as diferentes dimensões do capital social: estrutural e cognitiva. A parte estrutural do capital social é dividida em quatro partes: filiação em grupos, suporte social e ações coletivas. As questões sobre capital social cognitivo são divididas em duas categorias: confiança e coesão social. No presente estudo, foram utilizadas as seguintes questões: "Você pratica alguma religião?" e "Você visitou algum amigo, vizinho ou familiar ou algum deles visitou você nos últimos 12 meses?" com as opções de resposta: (1) não, (2) sim, menos de uma vez por mês, (3) sim, pelo menos uma vez por mês; "Nos últimos 12 meses, você foi membro de algum grupo voluntário ou algo do tipo?" (1) sim, (2) não; "Caso tenha algo infeliz acontecendo com você, alguém te ajudaria nessa situação?" (1) sim, (2) não; "Nos últimos 12 meses, você se uniu a outras pessoas em sua vizinhança ou bairro para tratar de questões importantes e de interesse geral?" (1) sim, (2) não; "Seus vizinhos e amigos podem ser confiáveis?" e "A maioria das pessoas no seu bairro geralmente tem boas relações umas com as outras?", com as opções de resposta de (1) sim, (2) às vezes, e (3) não (Apêndice B).

Para avaliar o capital social em nível comunitário, foi considerado o suporte social do bairro através da presença de centros culturais comunitários, associações de trabalhadores, associações de classe, número de dentistas e número de igrejas. Esses indicadores têm sido previamente utilizados como *proxy* para rede social comunitária e são, teoricamente, relacionados ao capital social e à coesão social (AIDA et al., 2008; AIDA et al. 2011a; ROSTILA, 2011, GUPTA et al., 2015). As variáveis de contexto foram definidas por área geográfica através do bairro em que a criança residia no T1.

2.2.3.4 Qualidade de vida relacionada à saúde bucal

Devido ao longo período de acompanhamento, as crianças foram avaliadas em diferentes faixas etárias. Assim, conforme o ponto no tempo, a QVRSB foi avaliada através do instrumento mais apropriado.

No T1 e no T2, a QVRSB foi avaliada através da versão brasileira do *Early Childhood Oral Health Impact Scale* (ECOHIS), aplicado aos pais ou responsáveis, uma vez que as

crianças não possuíam habilidades cognitivas para compreender e responder adequadamente (PAHEL; ROZIER; SLADE, 2007; TESCH et al., 2007; SCARPELLI et al., 2011). O ECOHIS é composto por 13 itens e subdividido em 2 sessões. 9 itens correspondem à seção de impacto infantil (sintomas, função, psicologia, domínios de autoimagem e interação social) e 4 itens à seção de impacto familiar (ansiedade dos pais e função familiar). As respostas foram obtidas utilizando uma escala Likert com opções de pontuação podendo variar de 0 a 5 pontos (0 = nunca, 1 = quase nunca, 2 = ocasionalmente, 3 = frequentemente, 4 = muito frequentemente e 5 = não sabem). A soma total dos escores podem variar de 0 a 52. Escores gerais mais altos indicam uma pior QVRSB.

Na avaliação correspondente ao T3, a QVRSB foi mensurada através do questionário *Child Perceptions Questionnaire* (CPQ8-10) (JOKOVIC et al., 2004; BARBOSA; TURELI; GAVIÃO, 2009). O CPQ8-10 apresenta 25 questões, subdivididas em 4 domínios: sintomas orais (5 questões), limitação funcional (5 questões), bem-estar emocional (5 questões) e bem-estar social (10 questões). Cinco opções de resposta são dadas para cada pergunta do questionário: “nunca” = 0; “uma ou duas vezes” = 1; “algumas vezes” = 2; “frequentemente” = 3; e “todos os dias/quase todos os dias” = 4. A pontuação final é composta pela soma de todos os itens. O resultado total do questionário pode variar de 0 a 100 pontos. Quanto maior for a pontuação obtida, maior é o impacto das condições de saúde bucal na qualidade de vida da criança.

No T4, a QVRSB foi avaliada através da versão reduzida do *Child Perceptions Questionnaire* 11-14 (CPQ11-14) (JOCKOVIC et al. 2002), previamente adaptado e transcrito culturalmente para ser utilizado em crianças brasileiras na referida faixa etária (GOURSAND et al., 2008; TORRES et al., 2009). A versão reduzida do CPQ11-14 possui 16 questões, subdivididas igualmente em 4 domínios: sintomas orais, limitação funcional, bem-estar social e bem-estar emocional. Cinco opções de resposta são dadas para cada pergunta do questionário: “nunca” = 0; “uma ou duas vezes” = 1; “algumas vezes” = 2; “frequentemente” = 3; e “todos os dias/quase todos os dias” = 4. A pontuação final é composta pela soma de todos os itens. O resultado total do questionário pode variar de 0 a 64 pontos. Quanto maior for a pontuação obtida, pior a QVRSB (Anexo A).

2.2.3.5 Escala de Senso de Coerência (SOC-13)

Para mensurar e qualificar o senso de coerência (SDC) no T4, os escolares responderam a versão curta da escala de senso de coerência com 13 itens (SOC-13), originalmente

desenvolvida por Antonovsky (1987) e que foi traduzida, adaptada e validada no Brasil (ANTONOVSKI et al. 1987; BONANATO et al., 2009; MENEGAZZO et al. 2020). As questões são divididas em três componentes: compreensibilidade, capacidade de gerenciamento e significado. As opções de respostas são apresentadas segundo uma escala Likert de 5 pontos, variando de acordo com o item do questionário, codificadas de 1 a 5. Para o cálculo do escore final, os itens são somados e o resultado pode variar de 13 a 65 pontos. Maiores escores representam um SDC mais elevado (Anexo B).

2.2.4 Variáveis clínicas

Os dados a respeito das condições bucais foram obtidos através de exames clínicos realizados por examinadores previamente treinados e calibrados em todas as ondas da coorte. Os escolares foram examinados individualmente, em um local adequado, com auxílio de gaze, sonda CPI ("*ball point*") e espelho clínico (WORLD HEALTH ORGANIZATION, 1997; WORLD HEALTH ORGANIZATION, 2013). No T1, as crianças foram examinadas nas UBS, em cadeiras odontológicas e com o auxílio de iluminação artificial (refletor). Nas demais avaliações (T2, T3 e T4), as crianças foram examinadas nas suas casas ou escolas, com o auxílio de luz natural. As variáveis clínicas mensuradas foram cárie dentária, sangramento gengival, presença de placa visível, trauma e má oclusão (Apêndice C). Nessa tese, foi considerada apenas a cárie dentária.

Para o exame bucal referente à presença de lesões de cárie, foram utilizados os critérios de diagnóstico do *International Caries Detection and Assessment System (*ICDAS) (ISMAIL et al., 2007), no qual todas as superfícies foram avaliadas conforme metodologia já descrita nos estudos anteriores dessa coorte (GUEDES et al., 2014; GUEDES et al., 2016). O ICDAS considera a presença de lesões de mancha branca (escore 1 e 2), lesões cavitadas em esmalte (escore 3), lesões de sombra (escore 4), e lesões cavitadas em dentina (escores 5 e 6). Superfícies hígidas são codificadas com escore 0. Para essa tese, foi considerada a presença de cárie não tratada através das lesões cavitadas (escore 3, 5 e 6).

2.2.5 Treinamento e calibração

A etapa de treinamento e calibração da equipe para a avaliação das variáveis clínicas em todas as ondas da coorte foi realizada de acordo com metodologia previamente descrita pela

OMS em seu manual básico para levantamentos epidemiológicos (WORLD HEALTH ORGANIZATION, 1997; WORLD HEALTH ORGANIZATION, 2013).

Em um primeiro momento, um pesquisador conceituado na área ministrou uma aula teórica sobre cada condição dentária a ser avaliada, com duração de 4 horas. Posteriormente, foi conduzido o exercício clínico-epidemiológico, no qual 20 dentes extraídos foram utilizados para avaliação e discussão dos casos entre os examinadores. Por último, foi realizada a calibração propriamente dita, onde 20 crianças foram observadas por cada um dos examinadores. Esse procedimento foi feito duas vezes, com o intervalo de sete dias. Um total de 15, 4, 4 e 7 examinadores foram calibrados e realizaram exames clínicos na linha de base (T1) e nos acompanhamentos (T2, T3 e T4), respectivamente. Em T1, os coeficientes Kappa inter e intraexaminador para os escores do ICDAS variaram de 0,70 a 0,96. Em T2, os valores de reprodutibilidade intra e interexaminador foram superiores a 0,85 e 0,91. Em T3, os coeficientes kappa inter e intraexaminadores variaram de 0,72 a 1,00 e, em T4, de 0,70 a 0,92.

As crianças que participaram dessa etapa eram alunos do ensino fundamental de alguma escola pública da cidade, não estando incluídas na amostra desse estudo. Os pais ou responsáveis assinaram previamente um TCLE autorizando a participação das mesmas. As crianças que necessitavam de atendimento foram encaminhadas à clínica de Odontopediatria da Universidade Federal de Santa Maria.

2.2.6 Análise estatística

A análise dos dados dos artigos 2, 3 e 4 foram conduzidas no programa estatístico STATA 14 (StataCorp. 2014. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP). Foi realizada uma análise descritiva da amostra, bem como a avaliação da diferença entre os indivíduos acompanhados e perdidos, através do teste Qui-quadrado (variáveis qualitativas) e Teste-t (variáveis quantitativas). A comparação entre os indivíduos avaliados antes e durante a pandemia de COVID-19 também foi realizada através desses testes. Análises de sensibilidade foram feitas através da simulação de Bootstrap. Todas as análises descritivas foram realizadas considerando o peso amostral utilizando o comando “svy” do Stata para amostras complexas.

A análise do artigo 2 foi realizada através de modelagem de equações estruturais (MEE), testando as vias pelas quais o capital social individual e comunitário no T1 afetariam a cárie dentária e QVRSB ao longo do tempo. A MEE foi composta por dois modelos: o modelo de mensuração para variáveis latentes e o modelo estrutural para avaliar as relações entre variáveis.

No modelo de mensuração, foi medido o capital social individual e comunitário. O capital social individual foi avaliado pelas variáveis: prática de atividades religiosas, participação em grupos voluntários, participação em grupos comunitários e participação nas atividades escolares do filho; e o capital social comunitário foi medido pelas variáveis: número de igrejas, associações de classe social e número de dentistas no bairro. O modelo estrutural analisou a magnitude e a direção entre as variáveis, estimando os efeitos totais, diretos (um caminho direto de uma variável para outra) e indiretos (um caminho mediado por outras variáveis) entre as variáveis de capital social e os desfechos de saúde bucal.

O método de estimação de Máxima Verossimilhança considerando valores perdidos foi utilizado em todas as análises da MEE. Índices de Modificação >10 e caminhos não significativos ($p<0,25$) foram usados como parâmetro para remoção de variáveis no modelo parcimonioso. A qualidade do ajuste foi medida através do Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) e Tucker-Lewis Index (TLI). O valor de RMSEA <0,05 e CFI e TLI >0,90 denota um ajuste adequado do modelo (KLINE, 2010). Os resultados foram apresentados utilizando coeficientes Beta (β), erro padrão (EP) e valores de p.

Análises inferenciais do artigo 3 foram realizadas através de modelos de regressão de Poisson em multinível para avaliar o efeito moderador do SDC na relação entre capital social individual e QVRSB. Os efeitos de moderação ocorrem quando a relação entre duas variáveis varia de acordo com uma terceira variável, que é referida como variável moderadora (IGARTUA; HAYES, 2021). Nossos dados foram testados em escala de interações multiplicativas para verificar a modificação do efeito, como em estudos anteriores (MACHADO et al. 2017; QIU et al. 2019). A estrutura multinível de análise considerou os indivíduos (nível 1) aninhados nos 15 bairros (nível 2). Características demográficas, socioeconômicas e clínicas foram incluídas no modelo como possíveis confundidoras da interação. Os resultados foram apresentados em *Rate Ratio* (RR) e intervalos de confiança de 95% (IC 95%).

Posteriormente, foi realizado um teste de inclinação simples para obter os valores preditivos conforme cada nível do moderador. Este procedimento permitiu o cálculo do efeito condicional do capital social na QVRSB de acordo com os diferentes níveis de SDC, gerando IC de 95% e valores de p. Foi considerado um nível de significância de 0,05.

No artigo 4, também foi realizada análise de regressão de Poisson em multinível para estimar o impacto de diferentes variáveis de capital social comunitário e individual no T1 na QVRSB em cada período de acompanhamento (T1, T2, T3 e T4). Variáveis demográficas,

socioeconômicas e clínicas foram incluídas no modelo ajustado como possíveis confundidoras (variáveis com p<0,20 na análise não ajustada foram consideradas no modelo ajustado). A estrutura de análise multinível considerou indivíduos (nível 1) aninhados nos 15 bairros (nível 2), e utilizou o esquema de efeito fixo com intercepto randômico. Os resultados são apresentados em *Incidence Rate Ratio* (IRR) e IC de 95%.

2.2.7 Aspectos éticos

Esse projeto foi aprovado pelo Comitê de Ética em Pesquisa (CEP) da Universidade Federal de Santa Maria (protocolo CAAE 11765419.1.0000.5346) (Anexo C). A autorização da 8ª Coordenadoria Regional de Educação de Santa Maria (Anexo D) e da Secretaria Municipal de Educação (Anexo E) também foram obtidas.

Os participantes do estudo foram informados sobre a metodologia, os objetivos, riscos e benefícios da pesquisa e, consentindo com a participação, assinaram o Termo de Assentimento (Apêndice D), assim como os responsáveis assinaram o Termo de Consentimento Livre e Esclarecido (TCLE) (Apêndice E). O termo de Assentimento e o TCLE foram preenchidos em duas vias, sendo uma entregue à criança e seu responsável e outra mantida em domínio do pesquisador. Todos os dados a respeito dos sujeitos da pesquisa estão sendo mantidos em absoluto sigilo.

Todas as informações coletadas, armazenadas e divulgadas são de responsabilidade do Prof. Dr. Thiago Machado Ardenghi, orientador desse projeto, e da pesquisadora Jessica Klöckner Knorst.

3 ARTIGO 1 – SOCIAL CAPITAL AND ORAL HEALTH IN CHILDREN AND ADOLESCENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Social capital and oral health in children and adolescents: a systematic review and meta-analysis

Running Title: Social capital and oral health

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Data Availability Statement

Data available on request from the authors - The data that support the findings of this study are available from the corresponding author upon reasonable request.

Contributors' Statement: Ms Knorst and Dr Tomazoni designed the study and the data collection instruments, collected data, carried out the analyses, drafted and revised the manuscript. Ms Sfreddo designed the study, collected data and revised the manuscript. Dr Vettore, Dr Hesse and Dr Ardenghi conceptualized and designed the study, coordinated and

supervised data collection and critically reviewed the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Abstract

Objectives: To systematically evaluate the association of individual and contextual social capital with oral health outcomes in children and adolescents.

Methods: Electronic searches were performed in PubMed/Medline, Embase, Web of Science, and Scopus databases for articles published from 1966 up to June 2021. Two calibrated reviewers screened and critically appraised the identified papers. Observational studies that evaluated the relationship of individual or/and contextual social capital or their proxies with oral health outcomes in children and adolescents using validated methods were included. Quality assessment was conducted using the Newcastle-Ottawa Scale. Data were extracted for narrative synthesis and meta-analysis followed by a meta-regression model. Meta-analysis using random-effects method was used to estimate pooled prevalence ratio (PR) and 95% confidence intervals (CI).

Results: Of the 3,060 studies initially retrieved, 31 were included in the systematic review and 21 in the meta-analysis, totaling 81,241 individuals. The clinical outcomes included dental caries and gingival bleeding and subjective outcomes were oral health-related quality of life (OHRQoL) and self-rated oral health (SROH). Individuals with lower levels of individual social capital had a higher prevalence of poor clinical (PR 1.11; 95%CI 1.02-1.22) and subjective (PR 1.25; 95%CI 1.09-1.45) oral health conditions. The prevalence of worse clinical (PR 1.34; 95%CI 1.11-1.61) and subjective (PR 1.56; 95%CI 1.13-2.16) oral health outcomes were also associated with lower levels of contextual social capital. In general, the contextual level of social capital exerted more impact, and the subjective oral health outcomes were the more affected.

Conclusions: Contextual and individual social capital were positively related to oral health outcomes, such as dental caries, gingival bleeding, SROH and OHRQoL in children and adolescents.

Keywords: Children. Oral health. Social network. Social support. Systematic review.

Introduction

Increasing evidence suggests that a broad range of determinants, such as biological, psychological, behavioural, social, environmental, and political factors may influence health.[1,2] Among these factors is social capital, which has been highlighted as one of the main determinants of health according to the World Health Organization (WHO).[3,4] Social capital was first defined as the aggregate of resources linked to an individual or a group through a network of relationships of mutual recognition, emphasizing the individual's ability to use these resources for individual benefit.[5] Posteriorly, social capital has been defined as characteristics of social organization, such as networks, norms, and trust, which facilitate coordinated actions and can improve the community as a whole, regardless of individual connections.[6]

In this context, the fact that social capital is an individual or contextual attribute has been divergent in the previous literature.[5,6] However, current approaches have defined capital as an attribute in both levels.[7] In this perspective, social capital resides in social structures, such as communities and workplaces, as well as in the sources that individuals access through social networks.[7] Thus, social capital has been defined as the characteristics of the social structure that operate as resources accessed by individuals that facilitate collective actions and mutual cooperation.[6] In this sense, social capital can be defined as the social resources that evolve within accessible social networks or in social structures characterized by collective trust.[6,7] These social resources facilitate access to various returns that can benefit the individual and the collective.

Despite the controversies over the concept and the growing number of criticisms, a large body of evidence suggests that social capital benefits health.[4,8-12] It has been demonstrated that high levels of individual and contextual social capital are associated with better self-perceived general health and better mental health.[4] In addition, social capital has also been related to clinical and subjective oral health outcomes. High levels of social capital were associated with lower levels of dental caries and gingival bleeding.[8-10] Moreover, better self-rated oral health (SROH) and oral health-related quality of life (OHRQoL) were related to higher levels of social capital.[11,12]

Social capital is considered an important factor that can influence oral health outcomes[13] across different life periods, including childhood and adolescence. These are crucial periods for health promotion and health care as they are characterized by biological and psychosocial changes as well as adaptations to social environmental.[14] In addition, the role of social determinants of health in creating and perpetuating oral health inequalities in children has been widely recognized.[15] Thus, studying social factors in childhood and adolescence is fundamental,

as this age group is vulnerable to several health risk factors, which can perpetuate throughout the life course.[14,15]

Although previous studies have demonstrated the association between social capital and oral health measures in children and adolescents, no systematic review summarizing these findings has been published to date. In addition, understanding which oral health outcomes are most affected by different levels and indicators of social capital remains unknown. Further knowledge on this topic can provide the groundings for planning public health strategies focused on specific determinants and the establishment of more tailored and effective oral health programs. Thus, the aim of this study was to systematically review the evidence from observational studies assessing the association between individual and/or contextual social capital and oral health outcomes in children and adolescents.

Methods

This study was conducted following the Cochrane Handbook guidelines[16] and is reported according to the Meta-Analyses of Observational Studies in Epidemiology (MOOSE) group.[17] A review protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO; protocol number: CRD42019138197). The research question was "Does social capital influence oral health outcomes in children and adolescents?". The following PECO strategy was used: Population (P): children and adolescents; exposure (E): low social capital; comparison (C): high social capital; and outcome (O): clinical and subjective oral health measures assessed through valid methods.

Searches

Electronic searches for articles published from 1966 up to June 2021 were conducted in PUBMED, SCOPUS, EMBASE, ISI Web of Science databases. The reference lists of all full texts of interest were also screened for additional relevant research. The search was performed using a combination of controlled vocabulary and key words, including different concepts and measures of social capital and oral health outcomes (Supplementary Table 1).

Two reviewers (JKK and FT) independently screened the papers. The reviewers initially examined titles and abstracts to select papers for full-text screening using the following inclusion criteria: (1) observational cross-sectional and cohort studies (prospective and retrospective) evaluating the association between social capital and oral health outcomes; (2) studies assessing individual- and/or contextual-level social capital through valid indicators or proxy measures; (3) studies that evaluated oral health through objective or subjective validated

methods; (4) studies including children and/or adolescents. No language and year of publication restrictions were applied. Studies involving specific populations, such as people with oral clefts, psychomotor disorders, indigenous people, or pregnant teenagers were excluded.

Data were extracted in duplicate and independently by two reviewers (JKK and FT). Disagreements between reviewers were resolved by discussion. Any persistent disagreement was decided by discussion with a third reviewer (CSS). The reliability between the reviewers was tested across 10% of the papers during the selection process. Kappa coefficients for agreement between the reviewers were excellent: 0.97 for titles and abstract, and 1.00 for full texts.

Data extraction

Two reviewers (JKK and FT) independently collected the following data from the included studies: authors, country; year of publication; design and duration; studied population and age; sample size; oral health outcome; social capital variable (individual and/or contextual) and information on risk of bias.

Risk of bias (quality) assessment

The methodological quality of the included studies was assessed by two reviewers (JKK and FT) using the Newcastle Ottawa Scale (NOS)[18] for cohort and case-control studies and the adapted NOS for cross-sectional studies.[19] The NOS evaluates the methodological quality of primary studies using a star system according to three categories: (1) patient selection (up to four stars); (2) the comparability of the study groups (up to two stars), and (3) assessment of outcome (up to three stars). Subsequently, each study was classified according to the risk of bias: high (0-3 stars); medium (4-6 stars); or low (7 or more stars).[20]

Theoretical aspects

There is no standardized method to measure social capital. Moreover, social capital cannot be measured directly but can be inferred from its determinants or manifestations.[13,21] Thus, studies measuring social capital by indicators or proxies were considered in this review.

Individual indicators commonly used refer to social participation in organizations, social networks, or social support, such as contact with friends and family, support systems, religious participation, and levels of trust and reciprocity.[8,9,12] Contextual social capital has been assessed through indicators of community social networks, such as the number of workers or entities in the community (e.g. community cultural centers), as well as through the level of

empowerment, social control, political efficacy, and quality of the neighbourhood.[6,10,12] The aforementioned theoretical aspects related to individual and contextual social capital were considered for the inclusion of primary studies and for grouping social capital indicators.

Considering the oral health outcomes, previous literature suggests that clinical and subjective measures represent different constructs.[22,23] It has been recognized that clinical indicators measure disease and subjective indicators measure health. In this sense, clinical conditions, such as dental caries and gingivitis, refer to the effects of pathological processes on the mouth that are clinically evaluated. On the other hand, subjective conditions, such as self-perceived oral health and quality of life, refer to subjective experiences of functional, social, and psychological well-being perceived by the individual regarding their oral health.[22,23] Thus, oral health outcomes were grouped considering this rationale for analytical purposes.

Synthesis of data and variables

Estimates of the association between social capital and oral health outcomes were collected. All indicators or proxies of individual and contextual social capital were considered. More than one social capital indicator per study was extracted when possible. Separate meta-analyses were carried out according to the level of social capital (individual and contextual); and type of oral health outcome: a) oral clinical measure (dental caries and gingival bleeding) and b) subjective oral health measure (OHRQoL and SROH). Subgroup meta-analysis was also performed according to each outcome separately, study design (cross-sectional and cohort), age group (children, adolescents and both), and specific social capital indicators, such as social control, social networks (visit friends and neighbors, religious practice, school involvement, number of workers or entities in the community), social support (from friends, school, family or neighbourhood) and social trust (sense of belonging, safety or trust in people or the community in general). The pooled estimates were obtained to indicate the following association between social capital and oral health: the lower the social capital the poorer the oral health condition.

Meta-regression evaluated the potential sources of heterogeneity among the selected studies, such as the risk of bias (medium or low), type of analysis of the primary study (adjusted or crude), instrument or index used to assess the oral health outcome (type of questionnaire or index, e.g. CPQ_{11-14} or DMFT index), country's economic classification, grouped into high-income, upper-middle, lower-middle, or low-income countries[24], and age group: children (up to 11 years old), adolescents (12 to 19 years old)[25], or both.

Data analyses

Meta-analysis and meta-regression were carried out using R statistical software (version 3.6.1). The oral health outcomes were dental caries, gingival bleeding, OHRQoL, and SROH, measured using validated instruments represented by overall scores, means, prevalence of impacts, or severity. Meta-analysis was performed to obtain pooled estimates using a random-effects model. The measurements from the primary studies with available data were converted into a log-binomial and subsequently transformed into prevalence ratio (PR) with respective 95% confidence intervals (CI)].[26] A global meta-analysis was performed according to individual and contextual level social capital and clinical and subjective oral health outcomes. Sub-group meta-analysis were conducted considering specific oral health outcomes, study design, and the social capital indicator. Heterogeneity was examined using the I^2 statistic.[16]

The potential sources of effect modification and heterogeneity in the general meta-analysis were evaluated through meta-regression analysis according to the study design, outcome measure, social capital indicator, risk of bias, type of analysis of the primary study, age group and economic classification of the country.

Results

The initial search resulted in 3,060 records. After screening titles and abstracts and removing the duplicates, 68 articles were selected for the full-text screening. No additional paper was retrieved from the reference list of selected papers. After the full-text analysis, 31 articles (Table S2 and S3) were included in the narrative synthesis, totalizing 136,307 individuals. Finally, a total of 21 articles were included in the quantitative synthesis (81,241 individuals) (Figure S1).

Table S2 presents the main characteristics of the selected studies. In general, the studies evaluated the association between social capital variables and oral health outcomes in children (n = 9), adolescents (n = 13), or both age groups (n = 9). Of the 31 included studies, 21 were cross-sectional and ten were cohort studies. The sample size ranged from 186 to 67,388, and participants' age ranged from 1 to 19 years. The studies were conducted in 9 different countries, and most of them were carried out in Brazil (n= 13) and the United States (n=9). A total of 27 studies investigated individual social capital variables, whereas 10 studies assessed contextual social capital. Individual social capital was predominantly assessed through social support, social trust, and social networks, such as family or friends visit, group membership, close friends, school involvement, religious attendance. Most studies on contextual social capital considered the number of formal institutions in the neighbourhood, such as cultural community centers, worker associations, and churches as indicators of social capital. The oral health

outcomes included in the studies were dental caries (n= 17), OHRQoL (n=9), gingival bleeding (n=4), and SROH (n=5). Most of the studies (n=29; 93.5%) presented a low risk of bias.

The meta-analysis of the association of social capital with both subjective and clinical oral health outcomes according to individual social capital (n=19) and contextual social capital (n=7) are presented in Fig. 1 and Fig. 2, respectively. In the random effects for the individual model (I^2=92%; p<0.01), children and adolescents with lower levels of individual social capital had a higher prevalence of poor clinical (PR 1.11; 95%CI 1.02-1.22) and subjective (PR 1.25; 95%CI 1.09-1.45) oral health. For the contextual model (I^2=62%; p=0.02), the worst normative (PR 1.34; 95%CI 1.11-1.61) and subjective (PR 1.56; 95%CI 1.13-2.16) oral health conditions were associated with lower levels of social capital. In general, the contextual-level social capital had a stronger impact, and subjective oral health outcomes were the most affected. According to the adjusted meta-regression analysis (Table S4), about 75.1% (R2) of the heterogeneity of the individual model could be explained by the study design, age group, risk of bias, the instrument of outcome measurement, type of analysis of the primary study, and social capital indicator (p<0.01). For the contextual model, about 82.5% (R2) of the heterogeneity could be explained by the study design, age group, instrument of outcome measurement, and social capital indicator (p=0.20).

Table 1 shows the results of the meta-analysis according to different subgroups. Regarding the study design, lower levels of individual and contextual social capital were associated with worst oral health when data from cross-sectional studies were pooled. Meta-analysis involving cohort studies revealed such relationship only for the contextual social capital. In subgroup meta-analyses according to oral health outcomes and individual-level social capital, the low social capital was associated with dental caries (PR 1.16; 95% CI 1.03-1.31) and poorer OHRQoL (PR 1.22; 95% CI 1.02-1.46). Gingival bleeding and SROH were not associated with individual social capital. At the contextual level, individuals with poor community social capital were more likely to present dental caries (PR 1.33; 95% CI 1.05-1.68) and worse OHRQoL (PR 1.34; 95% CI 1.07-1.69). Considering the age groups separately, adolescents with low social capital presented poorer oral health outcomes. At the contextual level, both children and adolescents had their oral health affected by low social capital. The effect of individual-level social capital on oral health outcomes was especially observed when social networks was the indicator of social capital. Social networks and social support were the main determinants of oral health conditions when social capital was assessed at the contextual level.

Discussion

This is the first systematic review summarizing the evidence from observational studies concerning the association between different individual and contextual social capital indicators and oral health outcomes in children and adolescents. The main findings suggest that lower levels of individual and contextual social capital had a negative effect in both normative and subjective oral health outcomes. It was also observed that most indicators used to assess social capital are related to social networks and social support. In addition, contextual-level social capital had a greater effect on oral health outcomes than individual social capital, whereas the association between social capital and oral health was stronger when subjective oral health outcomes were considered.

Our findings showed the negative influence of low individual social capital on normative and subjective oral health outcomes, which is in accordance with previous studies.[8,9,11,12] Different explanations have been proposed to explain this relationship. For instance, it has been reported that high levels of social capital can influence oral health-related behaviours through social norms and informal social control, as well as through the influence and diffusion of knowledge among individuals within social networks.[13] In this sense, high levels of social capital may influence individuals to adopt healthy oral health behaviours, as well as facilitating the dissemination of norms, healthy habits, and a greater probability of using health services,[27] which has been related to oral health outcomes.[12] In addition, social capital can buffer the effect of stress on health, acting as a protective factor through social support and mutual feelings of security and belonging.[13] Thus, social support may act as a potential intangible resource to cope with stress, interacting with people's coping and resilience style,[28,29] which has been related to normative[9] and subjective oral health outcomes.[30]

Our results also demonstrated that oral health outcomes are affected by contextual social capital, as previously shown in the literature.[11,12,31] A community with high social capital is characterized by the existence of associations and active citizens, leading to a positive social environment, which is characterized by trust and social cohesion between individuals.[32] Thus, these communities are more successful in strengthening the common interests of the neighbourhood and influence health policy decisions, as well as in the dissemination of healthy norms to support the adoption of behaviours that may improve oral health.[13] It has been suggested the probability of adopting a certain behaviour may depend on the degree to which such behaviour has already been adhered into the community.[33] In addition, individuals who live in neighbourhoods with high social capital tend to experience lower levels of psychosocial

stress through greater perception of social support,[13] which also positively impacts on clinical conditions and self-reported oral health measures[12], as demonstrated in our findings.

The contextual-level social capital showed a higher impact on oral health measures in children and adolescents than individual-level. This finding can be explained because social capital of the community is also intimately related to other structural environmental social aspects, such as income.[33] In addition, evidence also suggests the positive effect of sharing a positive social environment, represented by community social capital, on people's oral health, regardless of their level of individual risk.[6,34] As a result, living in communities with low social capital tends to negatively impact on individual's oral health. Notwithstanding, the structural aspects of neighbourhoods and communities tend to perpetuate over time,[34] since they are more complex and difficult to change. This may explain our finding on the association between social capital and oral health in cohort studies only when the former was assessed at contextual level.

Considering the separate analyses of the different oral health outcomes, only dental caries and OHRQoL remained associated with individual-level social capital. These findings are following the previous literature.[8,11,12] A possible explanation for the lack of association of gingival bleeding and SROH with social capital might be the low of power of the pooled estimates since few studies considered these outcomes. At contextual level, all oral health outcomes were associated with social capital, which is in agreement with the literature. [10,12,30,35] However, only one study considered SROH and gingival bleeding, which limits the generalization of this finding.

It is important to highlight the impacts that social capital can exert on oral health according to the different age groups. Our findings showed that at the individual level, only adolescents had their oral health affected by low social capital. At the contextual level, oral health of all age groups was impacted by social capital, but the greatest impact remained amongst adolescents. A possible explanation for these findings is because individual-level social capital may affect oral health through different ways among these individuals. During childhood, social capital is usually measured through parents,[10-12] which may not directly impact on the child's oral health, since the latter may be influenced by environmental characteristics and family behaviours.[15,32] In addition, the levels of individual social capital may change over time, and variations also occur according to gender, personal experiences, and age.[36] On the other hand, contextual social capital exerted an impact on oral health of both children and adolescents since it reflects structural aspects of communities, which impact the lives of residents and their families,[33,34] as previously discussed. In addition, contextual social capital impacted more strongly on adolescent oral health, which may reflect the cumulative

effects of low social capital at neighbourhood level, which has already been demonstrated in previous studies.[10,12]

Regarding the use of different indicators of social capital, the effect of individual-level social capital on oral health was observed especially when social networks was the indicator. One possible explanation for this finding is because individual social networks might be the main type of accessible social capital among children and adolescents. In this sense, they are more likely to have their oral conditions affected by their social networks, such as those from friends, neighbours, and family members,[8,11] as well as through participation in school activities.[12,37] Notwithstanding, individual social support and social trust can have a more significant impact on the individuals' lives according to their maturity, resilience, and perception throughout life.[27,38] In addition, there is a reciprocal interrelationship between social networks and social support once one can lead to the other.[7] All contextual social capital indicators evaluated in the present review were associated with oral health outcomes, despite social control being considered in a single study. At contextual level, several social capital indicators tend to characterize the neighbourhood as a whole.[7] This means that, the higher community social networks, the greater the community's social support, social trust, and social cohesion.[6]

Some limitations and strengths of this systematic review must be acknowledged. First, we considered social capital indicators, which may not give a complete view of social capital. However, there is still no agreement around social capital conceptualization and measurement, in addition to the fact that it cannot be directly measured.[7,21] Although some instruments have been developed to measure social capital and social support,[39] few indexes used to assess social capital were subjected to validity and reliability assessment. In this sense, most researchers have used indicators or proxy measures that were supposed to be theoretically linked to the concept of social capital.[7,21] In addition, the different instruments used to measure social capital in the included studies were considered in the meta-regression analysis. The meta-analysis presented in this study showed a high heterogeneity, which may also limit our findings. This heterogeneity is possibly because the meta-analysis was performed pooling data of studies assessing different oral health conditions, different measures of social capital, as well as studies that included different confounders for adjustment. However, all these factors were considered in the subgroup meta-analyses and in the meta-regression.

The strengths of this study were the inclusion of studies using different indicators and levels of aggregation to evaluate the multiple dimensions of social capital. In addition, our study used important databases with no language or year of publication restrictions, as well as

included relevant oral health outcomes for children and adolescents, leading to a sample of 136,307 individuals. Finally, the high quality of the studies included indicate the robustness and validity for our findings. Systematic reviews are useful to provide a synthesis of evidence about a specific research question through the systematized search methods, critical appraisal, and extraction of relevant findings.[16] Since that this approach combines evidence from different studies, which may present similar or conflicting results, evaluating the risk of bias of each included study is essential. Moreover, findings from systematic reviews are misleading if primary studies with methodological flaws are included as their results are possibly biased.[16,18] Once most of the studies included in this review presented a low risk of bias, the consistency of our results is strengthened.

To conclude, this systematic review provides evidence that social capital is a meaningful factor associated with oral health outcomes in children and adolescents. Overall, individuals of these age groups with lower levels of individual and contextual social capital had a higher prevalence of poor clinical (dental caries and gingival bleeding) and subjective (OHRQoL and SROH) oral health measures. These results can be useful when planning public health strategies, which should take into consideration the social determinants of health, including contextual and individual social capital. Ultimately, the impacts of social inequities in oral health might be mitigated through enhancing social capital. Moreover, effective oral health promoting programs targeting children and adolescents may reach better outcomes if combined with strategies aiming to enhance social capital.

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Figure legends

Fig. 1 Meta-analysis evaluation and forest plot showing the combined prevalence ratios at individual level according to clinical and subjective outcomes of included studies (n=19)

Fig. 2 Meta-analysis evaluation and forest plot showing the combined prevalence ratios at contextual level according to clinical and subjective outcomes of included studies (n=7)

Fig. S1 Flow diagram selection process for studies included in this systematic review and meta-analysis

Table 1. Meta-analysis of the association between social capital and oral health conditions according to the different subgroups' characteristics

Subgroup	Individual social capital			Contextual social capital		
	N	PR (95% IC)	I^2 (%)	N	PR (95% IC)	I^2 (%)
Study design						
Cross-sectional	15	1.15 (1.06-1.26)	90.9*	5	1.49 (1.17-1.90)	73.2*
Cohort	4	1.20 (0.94-1.54)	88.1	2	1.28 (1.11-1.47)	0.0
Population						
Children	7	1.08 (0.96-1.22)	91.6	4	1.35 (1.20- 1.52)	0.0
Adolescents	9	1.40 (1.07-1.82)	85.8*	2	1.75 (1.33- 2.31)	34.8
Children/Adolescents	3	1.24 (0.92-1.68)	88.6	1	1.14 (1.03- 1.24)	-
Outcome						
Dental caries	8	1.16 (1.03-1.31)	94.2*	3	1.33 (1.05-1.68)	67.0*
Gingival bleeding	3	1.02 (0.90-1.16)	70.3	1	1.41 (1.04- 1.90)	-
SROH	3	1.41 (0.93-2.12)	81.0	1	2.22 (1.39- 3.53)	-
OHRQoL	5	1.22 (1.02-1.46)	87.8*	2	1.34 (1.07-1.69)	37.6*
Social capital indicator						
Social control	-	-	-	1	1.14 (1.03-1.24)	-
Social network	12	1.19 (1.07-1.32)	88.1*	3	1.32 (1.15-1.50)	0.0
Social support	6	1.10 (0.99-1.22)	79.0*	3	1.53 (1.23-1.90)	0.0
Social trust	2	1.41 (0.63-3.18)	91.7*	1	2.22 (1.39-3.53)	-

PR, Prevalence ratio of the relationship between social capital and oral health condition; CI, Confidence interval; I^2 statistics; SROH, self-rated oral-health; OHRQoL, oral health-related quality of life. *$p<0.05$.

Supplementary Table 1. Electronic databases searched and search strategies used in the systematic review (from 1966 up to June 2021)

Database	Search strategy used	Hits
Pubmed/MEDLINE (https://www.ncbi.nlm.nih.gov/pubmed)	((((((((((((((((((((((((((((((((((((social capital[MeSH Terms])) OR (social capital)) OR (social network*])) OR (social support)) OR (social support)) OR (social relationship*)) OR (social trust)) OR (civic trust)) OR (mutual trust)) OR (reciprocity)) OR (social participation[MeSH Terms])) OR (social participation)) OR (civic participation)) OR (community participation)) OR (community participation)) OR (civic engagement)) OR (group membership)) OR (volunteering)) OR (religious attendance)) OR (religiosity)) OR (social cohesion)) OR (empowerment[MeSH Terms])) OR (empowerment)) OR (neighborhood connection*)) OR (social integration[MeSH Terms])) OR (social integration)) OR (sense of belonging)) OR (organization membership)) OR (workers association*)) OR (volunteer association*)) OR (bonding)) OR (bridging)) OR (linking)) OR (vertical)) OR (horizontal)) AND ((((((((((((((((((((((((((((oral health[MeSH Terms]) OR (oral health)) OR (oral disease*)) OR (dental disease*)) OR (dental caries[MeSH Terms])) OR (dental caries)) OR (tooth decay)) OR (teeth decay)) OR (dental decay))) OR (toothache[MeSH Terms])) OR (toothache)) OR (dental pain)) OR (gingivitis[MeSH Terms])) OR (gingivitis)) OR (gingival bleeding)) OR (periodontal disease[MeSH Terms])) OR (periodontal disease*)) OR (periodontitis[MeSH Terms])) OR (periodontitis)) OR (tooth loss)) OR (teeth loss)) OR (oral impact*)) OR (oral health related quality of life)) OR (ohrqol)) OR (self-rated oral health)) OR (self-perceived oral health)) OR (subjective oral health)) OR (patient reported outcomes)) OR (PROMs))) AND ((((((((((children[MeSH Terms])))) OR (children)) OR (adolescent[MeSH Terms])) OR (adolescent)) OR (preschool child[MeSH Terms])) OR (schoolchildren)) OR (child*)) OR ((preschooler) AND (child))) OR (infant)))	1,380
Embase (https://www.embase.com)	'social capital' OR 'social support' OR 'social network*' OR 'social trust':ab,ti OR 'social relationship*':ab,ti OR volunteering:ab,ti OR 'workers association' OR (workers AND ('association'/exp OR association)) OR 'empowerment'/exp OR empowerment OR 'religious attendance' OR (religious AND ('attendance'/exp OR attendance)) OR 'religiosity':ab,ti OR 'neighborhood connection':ab,ti OR 'community participation':ab,ti OR 'social cohesion':ab,ti AND 'oral health':ab,ti OR 'oral disease':ab,ti OR 'dental caries':ab,ti OR 'tooth decay':ab,ti OR toothache:ab,ti OR 'dental pain':ab,ti OR gingivitis:ab,ti OR 'gingiva bleeding':ab,ti OR 'periodontal disease':ab,ti OR periodontontitis:ab,ti OR 'oral impact*':ab,ti	143

	OR 'oral health related quality of life':ab,ti OR ohrqol:ab,ti OR 'self-rated oral health':ab,ti OR 'patient reported outcomes':ab,ti AND children:ab,ti OR child:ab,ti OR schoolchildren:ab,ti OR adolescent:ab,ti OR 'infant':ab,ti	
Scopus (https://www.scopus.com)	((TITLE-ABS-KEY (social AND capital) OR (social AND network) OR (social AND support) OR (social AND trust))) AND ((TITLE-ABS-KEY (oral AND health) OR (oral AND disease) OR (dental AND caries) OR (tooth AND decay) OR (toothache) OR (dental AND pain) OR (gingivitis) OR (gingival AND bleeding) OR (periodontal AND diseases) OR (periodontitis) OR (tooth AND loss) OR (oral AND impact) OR (oral AND health AND related AND quality AND of AND life) OR (ohrqol) OR TITLE-ABS-KEY (self-rated AND oral AND health) OR TITLE-ABS-KEY (subjective AND oral AND health))) AND ((TITLE-ABS-KEY (children) OR (adolescent) OR (preschooler) AND (child) OR (schoolchildren)))	836
Web of Science (https://login.webofknowledge.com)	TOPIC: (social capital) OR TOPIC: (social network) OR TOPIC: (social support) OR TOPIC: (social trust) OR TOPIC: (social relationship) AND TOPIC: (oral health) OR TOPIC: (oral disease) OR TOPIC: (dental caries) OR TOPIC: (tooth decay) OR TOPIC: (toothache)OR TOPIC: (dental pain) OR TOPIC: (gingivitis) OR TOPIC: (gingival bleeding) OR TOPIC: (periodontal disease) OR TOPIC: (periodontitis) OR TOPIC: (oral impact) OR TOPIC: (oral health related quality of life) OR TOPIC: (ohrqol) OR TOPIC: (self-rated oral health) OR TOPIC: (self-perceived oral health) OR TOPIC: (subjective oral health) AND TOPIC: (children) OR TOPIC:(adolescent) OR TOPIC: (preschooler) OR TOPIC: (child) OR TOPIC: (schoolchildren)	701
Total		3,060

Supplementary Table 2. Narrative synthesis of the studies included in the systematic review (n = 31).

Author	Country	Design	Population	Age	N	Individual social capital	Contextual social capital	Outcome	Risk of bias	NOS*
Aida et al. (2007)	Japan	Cross-sectional	Children	3	3,086	-	Cultural community centers and worker associations	Dental caries (dmft)	Low	8
Ajrouch et al. (2010)	United States	Cross-sectional	Children	4 - 9	612	Social support	-	Dental caries (ICDAS)	Low	7
Bernebé et al. (2011)	United Kingdon	Cohort	Adolescents	15 - 16	561	Social support	-	Dental caries (DMFT)	Low	9
Burgette et al. (2019)	United States	Cross-sectional	Children	1 - 6	250	Social trust	-	Dental caries (DMFT)	Medium	5
Duijster et al. (2013)	Netherland	Cross-sectional	Children	5 - 6	630	Social networks	-	Dental caries (dmft)	Low	7
Duijster et al. (2014)	Netherlands	Cross-sectional	Children	6	630	Social support	Neighbourhood quality	Dental caries (dmft)	Low	9
Ferreira et al. (2021)	Brazil	Cohort	Children and adolescents	8 - 12	449	Attend religious group, volunteer networks and school involvement	Social class associations and churches	Gingival bleeding (CPI)	Low	7
Folayan et al. (2020)	Nigeria	Cross-sectional	Children and adolescents	6 - 16	1,001	Social support	-	Dental caries (dmft/DMFT)	Low	8
Fontanini et al. (2014)	Brazil	Cross-sectional	Adolescents	12 - 14	542	Social support and social networks	-	Dental caries (DMFT)	Low	10
Furuta et al. (2011)	Japan	Cross-sectional	Adolescents	18 - 19	967	Family social capital, social trust, informal social control, reciprocity at school	-	SROH	Low	8
Guarnizo-Herrenho et al. (2012)	United States	Cross-sectional	Children and adolescents	3 - 18	45,237	-	Neighbourhood social capital	Dental problems and SROH	Low	7
Guedes et al. (2014)	Brazil	Cross-sectional	Children	1 - 5	478	Visit to neighbour	Cultural community centers and worker associations	OHRQoL (ECOHIS)	Low	9

Iida et al. (2013)	United States	Cross-sectional	Children and adolescents	7 - 17	67,388	Social capital index	Neighbourhood social capital	Parents perception child oral health	Low	8
Ismail et al. (2008)	United States	Cohort	Children	0 - 5	788	Attend religious group	-	Dental caries (ICDAS)	Low	9
Kaewkamnerdpong et al. (2018)	Thailand	Cross-sectional	Adolescents	12	925	Close friends, school involvement	-	Dental caries (DMFT), OHRQoL (OIDP) and gingival bleeding (CPI)	Low	9
Knorst et al. (2019)	Brazil	Cohort	Children	8 - 12	449	Member of volunteer network and school involvement	Cultural community centers, worker associations and class associations	OHRQoL (CPQ8-10)	Low	8
Kumar et al. (2019)	India	Cross-sectional	Children and adolescents	5 - 12	186	-	Neighborhood social capital	Dental caries (DMFT)	Low	9
Menegazzo et al. (2018)	Brazil	Cross-sectional	Adolescents	12	1,134	Attend religious group	-	OHRQoL (CPQ11-14)	Low	9
Nelson et al. (2012)	United States	Cohort	Adolescents	14	224	Social support	-	Dental caries (DMFT)	Low	8
Patussi et al. (2006)	Brazil	Cross-sectional	Adolescents	14 - 15	1,302	-	Empowerment	Dental caries (DMFT)	Low	9
Patussi et al. (2007)	Brazil	Cross-sectional	Adolescents	14 - 15	1,302	Social support	-	SROH	Low	10
Porritt et al. (2015)	United Kingdom	Cohort	Children and adolescents	7 - 17	108	Social support	-	OHRQoL (CPQ11-14)	Medium	6
Reyes et al. (2020)	Brazil	Cohort	Children	2 - 7	467	Visit to neighbours and friends, visit to family, attend clubs and member of volunteer networks	-	Dental caries (ICDAS)	Low	9

Reynolds et al. (2015)	United States	Cross-sectional	Children and adolescents	2 - 17	2,186	Attend religious group and frequency of family eating meals together	Neighbourhood social capital	Parents perception child oral health	Low	8
Sfreddo et al. (2018)	Brazil	Cohort	Adolescents	14	770	Attend religious group	-	Gingival bleeding (CPI)	Low	9
Sfreddo et al. (2019)	Brazil	Cohort	Adolescents	14	747	Religiosity	-	OHRQoL (CPQ11-14)	Low	8
Silva et al. (2015)	Brazil	Cross-sectional	Adolescents	15 - 19	200	Participation in community groups	-	Dental caries (DMFT)	Low	9
Silva et al. (2020)	Brazil	Cohort	Children and adolescents	12	406	Social support	-	OHRQoL (CPQ11-14) and SROH	Low	8
Tomazoni et al. (2016)	Brazil	Cross-sectional	Adolescents	12	1,134	Attend religious group	-	Gingival Bleeding (CPI)	Low	9
Varenne et al. (2011)	Burkina Faso	Cross-sectional	Children and adolescents	6 - 16	1,606	Membership of a social network	-	Dental caries (DMFT)	Low	8
Vettore et al. (2019)	Brazil	Cross-sectional	Adolescents	12 - 14	542	Social support and social network	-	Dental caries (DMFT), SROH and OHRQoL (OIDP).	Low	10

CPI, community periodontal index; DMFT, decayed, missing and filed tooth; dmft, decayed, missing and filed tooth for primary dentition; ICDAS, International Caries Detection and Assessment System; OHRQoL, oral health-related quality of life; SROH, self-rated oral health; NOS, Newcastle Ottawa Scale; *Number of stars in NOS.

Supplementary Table 3. Studies included in the narrative synthesis, (n=31)

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Supplementary Table 4. Adjusted linear meta-regression analyses of potential source of heterogeneity in meta-analyses models

Variables	Individual social capital		Contextual social capital	
	Adjusted β (IC 95%)	**p-value***	**Adjusted β (IC 95%)**	**p-value***
Study design				
Cohort study	1 (reference)		1 (reference)	
Cross-sectional	-0.04 (-0.45; 0.37)	0.849	0.11 (-0.23; 0.45)	0.531
Population				
Adolescents	1 (reference)			
Children	-0.19 (-1.23; 0.39)	0.315	-0.24 (-0.56; -0.07)	
Children/Adolescents	0.28 (-0.56; 2.07)	0.262	-0.43 (-0.76; -0.10)	**<0.05**
Type of analysis				
Adjusted	1 (reference)		-	-
Crude	0.86 (0.24; 1.48)	<**0.05**		
Risk of bias				
Low	1 (reference)		-	-
Medium/High	0.83 (0.25; 1.42)	**<0.05**		
Economic country classification				
High-income	1 (reference)		1 (reference)	
Lower-middle-income	-0.95 (-1.53; -0.36)	**<0.01**	-0.05 (-0.41; 0.30)	0.752
Outcome instrument				
CPI	1 (reference)		1 (reference)	
DMFT/dmft	0.31 (0.01; 0.61)	**<0.05**	-0.05 (-0.54; 0.42)	**0.814**
ICDAS	0.81 (-0.02; 1.66)	0.056	-	
ECOHIS	0.32 (-0.12; 0.78)	0.154	0.13 (-0.50; 0.78)	0.673
CPQ_{8-10}	0.25 (-0.07; 0.59)	0.134	-0.12 (-0.67; 0.43)	0.670
CPQ_{11-14}	-0.10 (-0.41; 0.20)	0.513	-	
SROH	0.66 (0.10; 1.22)	**<0.05**	0.45 (-0.25; 1.15)	0.206
Social capital indicator				
Social network	1 (reference)			
Social support	-0.71 (-1.34; -0.09)	**<0.05**	0.29 (0.06; 0.53)	**<0.05**
Social trust	-1.09 (-1.82; -0.36)	**<0.01**	0.66 (0.19; 1.13)	**<0.01**
Amount of heterogeneity	**R^2 = 75.10%**		**R^2 = 82.57%**	

β, beta coefficient; IC, Confidence interval; *Test for residual heterogeneity p<0.001; Test of moderators p<0.01; CPI, community periodontal index; DMFT, decayed, missing and filed tooth; dmft, decayed, missing and filed tooth for primary dentition; ICDAS, International Caries Detection and Assessment System; SROH, self-rated oral health.

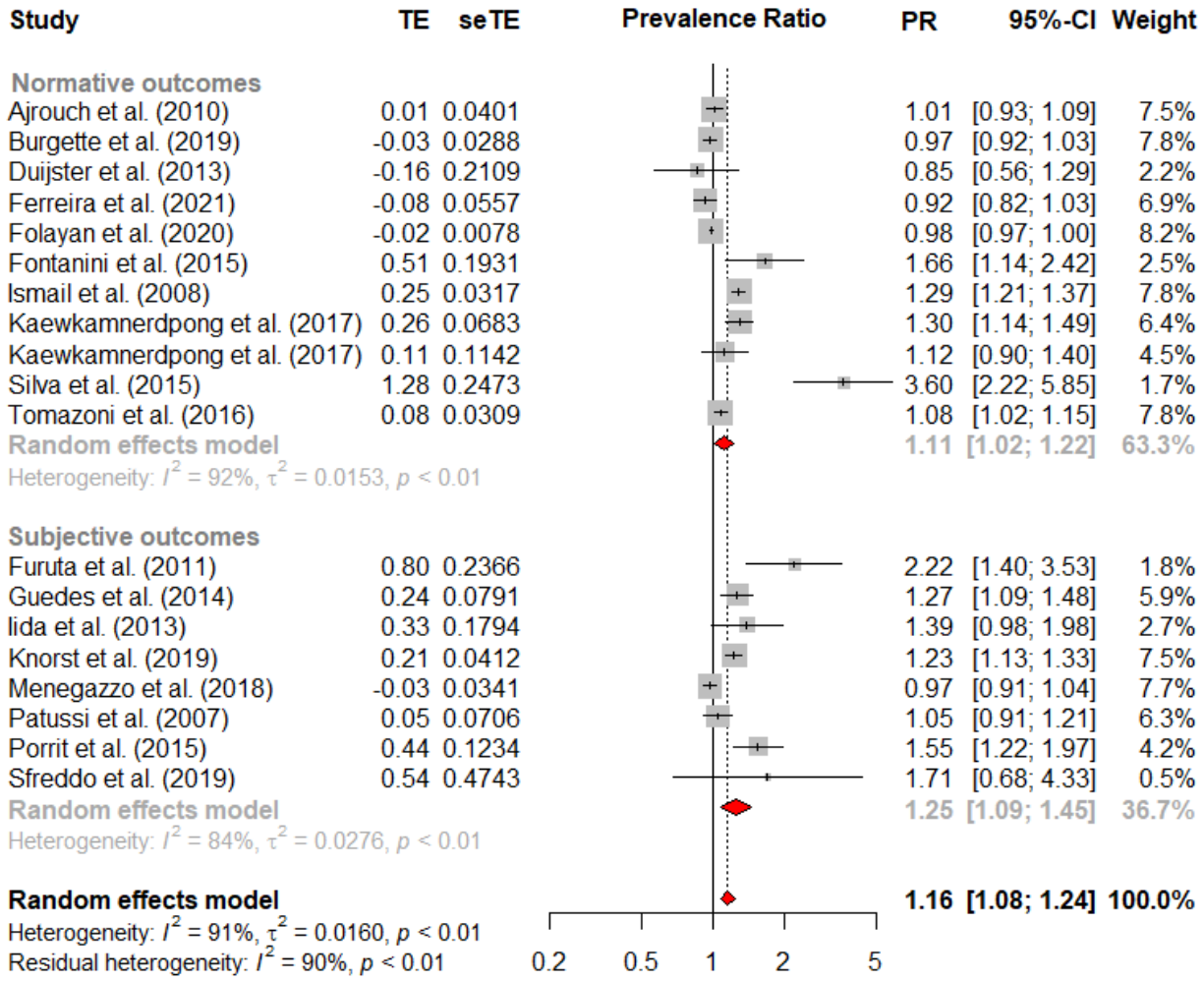

Fig. 1 Meta-analysis evaluation and forest plot showing the combined prevalence ratios at individual level according to clinical and subjective outcomes of included studies (n=19)

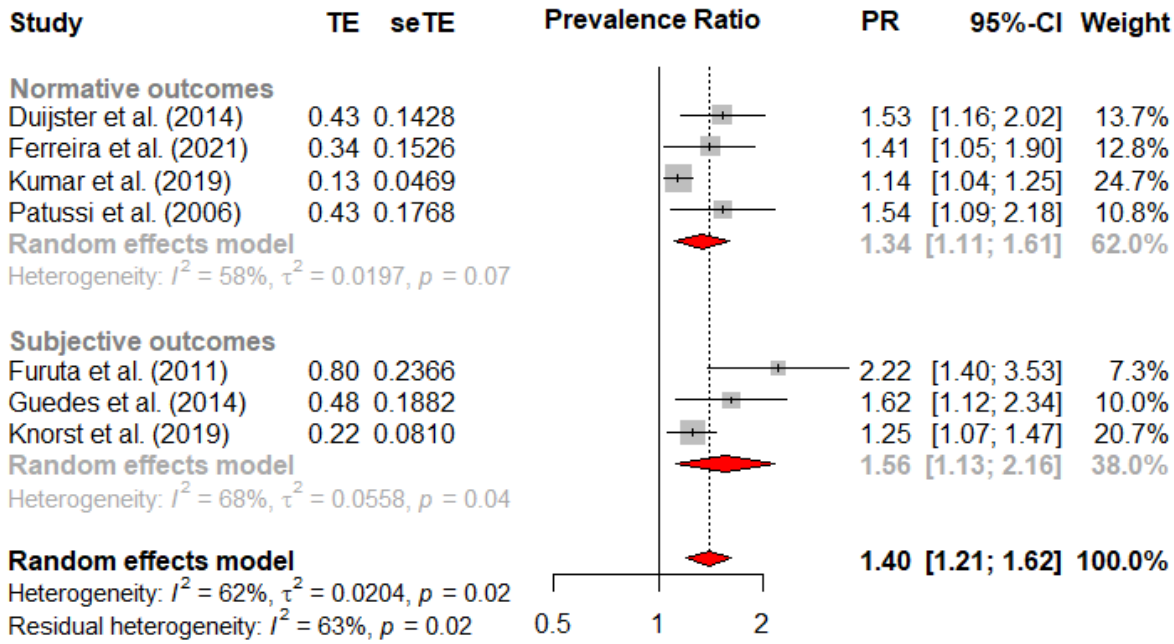

Fig. 2 Meta-analysis evaluation and forest plot showing the combined prevalence ratios at contextual level according to clinical and subjective outcomes of included studies (n=7)

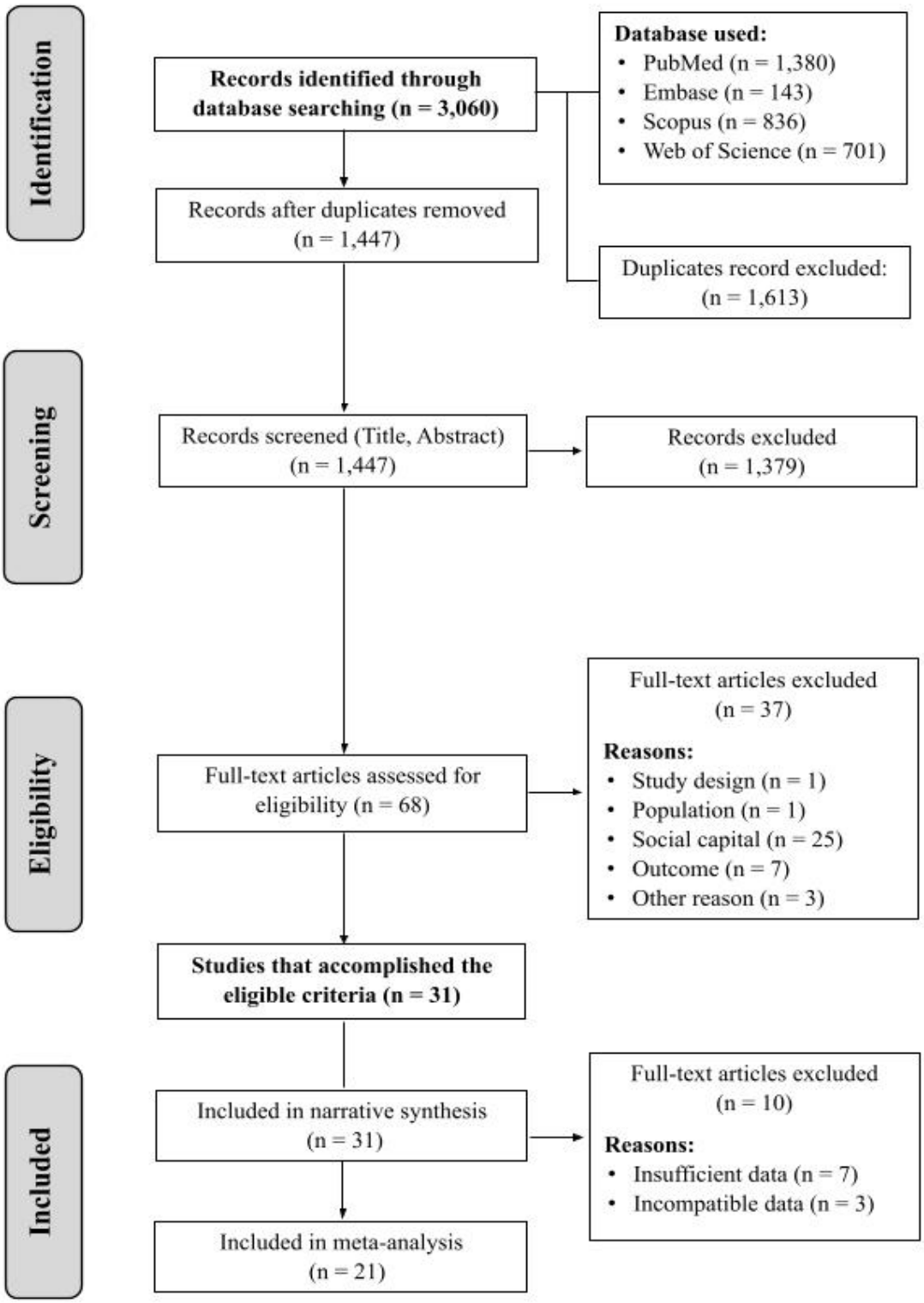

Fig. S1 Flow diagram selection process for studies included in this systematic review and meta-analysis

4 ARTIGO 2 – PATHWAYS BETWEEN SOCIAL CAPITAL AND ORAL HEALTH FROM CHILDHOOD TO ADOLESCENCE

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Pathways between social capital and oral health from childhood to adolescence

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Abstract

This study aimed to evaluate the theoretical pathways by which social capital can influence dental caries and oral health-related quality of life (OHRQoL) of children over time. This 10-year prospective cohort started in 2010 with a sample of 639 preschoolers aged 1-5 years from the southern Brazil. Community and individual social capital were assessed at baseline through the presence of formal institutions in the neighbourhood and social networks, respectively. In the 10-year follow-up, the individual social capital was evaluated by social trust and social networks. Dental caries was measured by the International Caries Detection and Assessment System (ICDAS), and the short version of the Child Perception Questionnaire (CPQ 11-14) was used to assess OHRQoL. Demographic, socioeconomic, behavioural (frequency of toothbrushing and use of dental services), and psychosocial (sense of coherence) characteristics were also assessed. Structural equation modelling was used to evaluate the associations between variables over time. About 429 children were reassessed at 10-years follow-up (67.1% cohort retention rate). High community social capital at baseline directly predicted lower occurrence of dental caries and better OHRQoL after 10 years. Social capital at community level also indirectly predicted lower occurrence of dental caries through sense of coherence, frequency of toothbrushing, and use of dental services. Individual social capital at follow-up was indirectly linked to OHRQoL via the psychosocial pathway (sense of coherence). Community-level social capital was associated with dental caries and OHRQoL over time. The relationship between individual social capital and oral health was mediated through the psychosocial pathway.

Introduction

The majority of oral diseases are preventable conditions that affect billions of people worldwide with a high economic impact on the societies, reflecting the persistence of widespread socioeconomic inequalities (Peres et al. 2019). Of them, dental caries is still considered a remarkable public health problem, especially during childhood and adolescence (Wright 2018). In addition to the economic impact, dental caries and other oral health conditions can also causes several consequences for the individuals' well-being and quality of life (Rauber et al. 2020).

Oral health is multifaceted and continuously influenced by the values and attitudes of people and communities, and reflects the physiological, social, and psychological attributes essential to the quality of life (Glick et al. 2016). Thus, assessment of oral health should incorporate patient-reported outcomes measures (PROMs). Oral health-related quality of life (OHRQoL) reflects people's comfort when eating, sleeping, engaging in social interactions, and their satisfaction with their oral health (Group 1995). In this context, oral health emerges as a positive concept that is interconnected with the available personal and social resources to the individuals, such as social capital (Rouxel et al. 2015).

Social capital can be defined as social resources evolving accessible social networks or social structures that are characterized by mutual trust, which facilitate access to various instrumental or expressive returns that can benefit the individual and the collective (Putnam 1993; Rostila 2011). The role of social capital on oral health conditions has been investigated. Individuals with higher levels of social capital had lower levels of dental caries and gingivitis (Fontanini et al. 2015; Ferreira et al. 2021), and reported better self-perception of health and OHRQoL (Knorst et al. 2019; do Amaral Júnior et al. 2021).

Some hypothetical pathways have been developed to explain the link between social capital and oral health (Kawachi and Berkman 2000). The different mechanisms by which social capital influence oral health include the psychosocial, behavioural, and use of health services pathways (Rouxel et al. 2015). The psychosocial pathway acknowledges that social capital exerts a protective effect on oral health via buffering the impact of stress, through enhancing the feelings of belonging, coping, resilience, and sense of coherence (Rouxel et al. 2015). The behavioural and use of dental service pathways suggest that social capital can impact oral health through the dissemination of healthy habits, such as oral hygiene or the search for dental care (Rouxel et al. 2015). However, to the best of our knowledge, no previous study has evaluated the influence of social capital on oral health from childhood to adolescence neither assessed the possible mediators of such relationship. The longitudinal assessment of oral health

outcomes during the transition from childhood to adolescence provides the opportunity to enhance the understanding on the determinants and causal paths of the health-disease process during such crucial period of biopsychosocial development.

This study aimed to explore the pathways by which individual and community social capital can influence the dental caries and OHRQoL from childhood to adolescence. We hypothesized that high individual and community social capital at baseline would directly predict lower dental caries and better OHRQoL at 10-year follow-up. Moreover, indirect effects of individual and community social capital at baseline on dental caries and OHRQoL at 10-year follow-up via psychosocial, behavioral, and use of oral health services pathways were also hypothesized.

Methods

This study is reported according to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines (von Elm et al. 2008). The Strobe checklist and detailed methodology are available in the Appendix file.

Study design and sampling process

This study was a 10-year prospective cohort study involving preschool children from Santa Maria, a southern city in Brazil. The cohort study involved the baseline and 3 follow-up assessments in the years 2012 (2 years), 2017 (7 years), and 2020 (10 years). The present study included baseline data in 2010 (T1) and followed up data in 2017 (T2) and 2020 (T3). The research protocol was approved by the Research Ethics Committee of the Federal University of Santa Maria (protocol CAAE 11765419.1.0000.5346). All participants agreed to participate and the caregivers signed an informed consent form.

A systematic probabilistic sample was selected involving all children aged from 1 to 5 years-old who attended primary healthcare units in the municipality on the National Children's Vaccination Day in 2010. Children with any physical or mental disabilities were not included. The primary sampling units included all 15 health care centres in the city that had dental chairs. Further details on the methodology used in T1 have already been published elsewhere (Piovesan et al. 2013).

The sample size calculation of the present study considered a standard error of 5%, confidence level of 95%, minimum effect size of 0.2 (Fontanini et al. 2015), two latent variables, 13 observed variables, and statistical power of 80% for structural equation modelling

(SEM) analysis. Considering a design effect of 1.2 and adding 30% for possible anticipated losses, the minimum required sample size was 335 children.

Follow-up assessment

All participants of the baseline examination were invited for a further assessment after 7 (T2) and 10 years (T3). Children's age ranged from 8 to 12 years at T2 and 11 to 15 years at T3. Follow-up data collection at T2 was carried out from January 2017 to March 2018. Follow-up data collection at T3 started in November 2019, which was interrupted in March 2020 due to the COVID-19 pandemic. Thereafter, with all appropriate measures, the continuation of this stage took place between October 2020 and January 2021. Follow-up data collections occurred through school visits as well as home visits which were arranged via telephone, Facebook or WhatsApp.

Data collection and variables

Data were collected through self-administered questionnaires, interviews, and oral examinations in all waves of the study.

Dental caries was evaluated at T1, T2 and T3 using the diagnostic criteria of the International Caries Detection and Assessment System (ICDAS) (Ismail et al. 2007). The dental exams were performed using a plain dental mirror (Golgran, São Caetano, Brazil) and CPI "ball point" periodontal probes (Golgran, São Caetano, Brazil). The examiners were previously trained and calibrated (Kappa coefficients ranged from 0.70 to 0.96). For the purpose of analysis, dental caries was assessed according to the number of teeth with the presence of untreated dental caries (ICDAS codes 3, 5 or 6).

OHRQoL was assessed using the most appropriate instrument in each period of evaluation considering the participant's age. At T1, OHRQoL was evaluated using the Brazilian version of the Early Childhood Oral Health Impact Scale (ECOHIS), applied to children's parents or guardians (Scarpelli et al. 2011). At T3, the adolescents completed the reduced Brazilian version of the Child Perceptions Questionnaire 11-14 (CPQ11-14) (Torres et al. 2009). Both questionnaires evaluate questions throughout a Likert scale. Posteriorly, the scores are added, and the higher the score, the worse the OHRQoL.

Individual social capital at T1 was measured through social networks of the participants' parents through the religious practice, participation in volunteer groups and in child's school activities. Individual social capital at T3 was evaluated according to adolescents' social networks and social trust. Community social capital at T1 was assessed according to the

presence of community cultural centres, number of dental workers and the number of churches in the neighbourhood where the participant lived at the baseline. The information of the neighbourhoods was obtained from the local council. The social capital variables were valid measures commonly used as indicators according to previous literature (Paxton 1999; Chor et al 2001; Aida et al. 2008; Ferreira et al. 2021).

The possible mediators between social capital and oral health measures were evaluated according to the theoretical explanatory pathways (Rouxel et al. 2015). Sense of coherence (SOC) was evaluated at T3 to represent aspects of the psychosocial pathway, and the adolescents answered the short version of the 13-item sense of coherence scale (SOC-13) (Antonovsky 1987; Menegazzo et al. 2020). The items are followed by a 5-point Likert scale and are added to calculate the final score. Higher scores represent a higher SOC. Frequency of dental visits and frequency of toothbrushing were assessed at T2 and T3 and used to evaluate use of dental services and health behaviours pathways, respectively. Use of dental services was assessed according to the methodology proposed by the WHO for oral health surveys, using the following question: "In the last year (12 months), how many times have you been to the dentist?" (WHO 2013). Frequency of toothbrushing was measured according to the number of times the individuals brushed their teeth daily. These measures were used as count variables.

Demographic data, including sex (girls or boys) and skin colour, and socioeconomic status were also measured at T1 and T3 as covariates. Skin colour was evaluated using the criteria established by the Brazilian Institute of Geography and Statistics (IBGE) (IBGE 2010) and dichotomized into whites and non-whites. Family income in the previous month was used to measure socioeconomic status (Galobardes et al. 2007), which was collected in Brazilian Real (US$1.00 is equivalent to R$5.4 approximately) and categorized into income quartiles.

Statistical analysis

The data were analyzed using the STATA 14 program. Descriptive analysis of the characteristics of the sample at T1, T2 and T3 was performed. Data between individuals who were assessed at follow-ups and dropouts, and between individuals at T3 evaluated before and during the COVID-19 pandemic were compared using the Chi-square test and the *t*-test. Analyzes were conducted considering the sampling weights ('svy' command).

Structural equation modelling (SEM) was used to assess the associations of individual and community social capital with dental caries and OHRQoL over time. The theoretical model used in this study was based on the conceptual framework of the Commission on Social Determinants of Health (Solar and Irwin 2010) and on the model proposed by Rouxel (Rouxel

et al. 2015) where the pathways by which individual and community social capital can affect oral health are hypothesized (Supplementary Figure 1).

Confirmatory factor analysis (CFA) was used to assess the measurement model for latent variables (individual and community social capital at T1). In the next step, structural equation modelling (SEM) assessed the magnitude of the direct and indirect relationships between latent and observed variables according to the theoretical model. The Maximum Likelihood with Missing Values (MLMV) estimation method was used in CFA and SEM analysis. The goodness-of-fit was measured using Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). The RMSEA value <0.05 and CFI and TLI >0.90 denotes an adequate model fit (Kline 2010). The results are present using standard coefficients (β), standard errors (SE) and p-values.

Results

Of the 639 children assessed at baseline, a total of 449 (a 70.3% cohort retention rate) and 429 (a 67.1% cohort retention rate) were re-evaluated at 7 and 10-year follow-up, respectively. The reasons for losses in follow-ups included the inability to find the individual, move to another city, and refusal to participate in the follow-up data collection. There were no significant differences in sample characteristics between followed individuals and dropouts for characteristics such as sex (p=0.227), household income (p=0.109), social capital variables (p>0.05), dental caries (p=0.737), and OHRQoL (p=0.486), nor between individuals evaluated at T3 before and during the COVID-19 pandemic (p>0.05). Regarding the main outcomes of this study, the mean number of teeth with untreated dental caries was 0.9 (SE 0.1), and the mean overall CPQ11-14 scores were 11.1 (SE 0.6) at T3 (Table 1).

Supplementary table 1 presents the measurement model assessed using CFA, which included two latent variables. Table 2 shows the standardized coefficients between variables in the full and parsimonious SEM models. Both models presented good fit values.

Figure 1 displays the significant pathways of the parsimonious model. Greater community social capital at T1 directly predicted lower untreated dental caries (β = -0.12) and better OHRQoL (β = -0.10) after 10-years. Individual social capital at T1 was not associated with oral health outcomes over time. Social trust at T3 was directly linked to untreated dental caries at T3 (β = -0.13). Higher levels of untreated dental caries (T3), greater frequency of dental visits in the last year (T3), lower frequency of toothbrushing (T3), and lower SOC (T3) directly predicted poor OHRQoL at T3.

Table 3 presents the total, direct and indirect effects between social capital variables, untreated dental caries and OHRQoL. High social capital at T1 indirectly predicted lower untreated dental caries via sense of coherence at T3, frequency of toothbrushing at T2 and T3, and use of dental services at T2 and T3 (β = -0.52). Social capital variables at T1 had no significant indirect effects on OHRQoL at T3, only direct. Social trust (β = 0.85) and social networks (β = -1.20) at T3 indirectly predicted OHRQoL at T3 through the SOC.

Discussion

This study explored the different pathways on the relationship of community and individual social capital with dental caries and OHRQoL from childhood to adolescence using a theoretical framework. Our findings partially confirmed the pre-established hypotheses. High community social capital at baseline was a relevant determinant of lower occurrence of untreated dental caries and better OHRQoL after 10 years. Moreover, different pathways on the influence of community social capital on lower occurrence of untreated dental caries were identified. The hypotheses of the direct and indirect effects of individual social capital at T1 on oral health conditions over time were not confirmed. However, individual social capital at T3 was indirectly associated with OHRQoL at T3 through the aspect of the psychosocial pathway reflected by SOC.

High levels of social capital at the community level in early childhood directly impacted on the lower occurrence of dental caries and in better OHRQoL after 10 years. In our study, social networks and social support at the community level were used as indicators to represent the latent variable of community social capital. The neighbourhood characteristics used to assess social capital in this study, including the number of workers, health service providers (Aida et al. 2008; Kowitt et al. 2015), and religious temples (Ferreira et al. 2021), can be considered valid measures since they have been associated with community social capital (Brunner and Marmot 2006; Solar and Irwin 2010; Rostila et al. 2011). Thus, a community with high social capital is composed of different formal institutions and active citizens, leading to a social environment characterized by higher levels of mutual trust and social cohesion (Brunner and Marmot 2006; Solar and Irwin 2010; Rouxel et al. 2015). A possible explanation for this finding is that communities with high levels of social capital are considered positive environments where healthy habits are disseminated and supported, and there is greater access to dental services. In addition, neighbourhood-level social capital can buffer the harmful effects of stress acting as a protective factor due to higher social support between residents (Kawachi

and Berkman 2000). Thus, community social factors can predict better oral health outcomes for residents, such as dental caries and OHRQoL.

The impact of community social capital on dental caries over time was also mediated by psychosocial (SOC), behavioural (frequency of toothbrushing), and use of dental services (frequency of use of dental services) pathways. Previous evidence supports the abovementioned relationships in dental research (Mathur et al. 2015; Kumar et al. 2016; Tomazoni et al. 2019; Ha et al. 2020). The behavioural pathway acknowledges that social capital can influence health behaviours through norms, informal social control, peer influence, and dissemination of knowledge (Kawachi and Berkman 2000; Rouxel et al 2015). Thereupon, high levels of social capital may promote the adoption of favourable oral health-related behaviors, such as a higher frequency of toothbrushing, which is considered to be a protective factor for dental caries (Kumar et al. 2016). The psychosocial pathway considers that high levels of social capital exert a protective influence on health by mitigating the stress consequences through enhancing the feelings of support, security, and belonging (Kawachi and Berkman 2000). Thus, social capital may positively impact on people's natural coping strategies and sense of coherence, that have also been related to the occurrence of dental caries (Tomazoni et al 2019). The use of dental services pathway can be supported because dwellers of communities with higher levels of social capital are more engaged and more successful in (Rouxel et al 2015), which has also been associated with dental caries (Hashim et al. 2006).

Individual social capital at baseline was not associated with oral health outcomes over time. This finding might be explained because the levels of individual social capital may shift over time, and variations also occur according to gender and personal experiences (McDonald and Mair; 2010). Nevertheless, individual social capital at baseline was assessed through parents, which may not impact on their children's lives after a long period of time. In this context, social capital at the community level showed a greater impact on oral health over time than the individual-level social capital. Structural neighbourhood conditions, such as income, social capital, and social cohesion, are closely interconnected and less likely to change in the short term (Sisson 2007). Thus, the present findings confirmed that structural aspects tend to have a cumulative impact on one's health from childhood to adolescence, regardless the exposure to individual risk factors.

Individual-level characteristics and oral health outcomes were indirectly associated when such relationship was assessed using concurrent measures notwithstanding. Our findings showed that individual social capital variables at follow-up were indirectly linked to dental OHRQoL through SOC (psychosocial pathway). SOC can be defined as a global orientation

that allows people to manage stress more effectively, identify their internal and external environments and find solutions for their health (Kowitt et al 2015). It has been suggested that SOC interacts with a person's natural coping style and social support. Thus, the extent of networks and social trust can influence the development of a strong or weak SOC (Gupta et al. 2015) mainly in adolescence. Previous evidence in dental research has been shown that individuals with high SOC have better OHRQoL (Baker et al. 2010), particularly in terms of how much a person is able to cope with poor health. Therefore, accordantly with our results, higher levels of social networks and social trust during adolescence can positively impact on OHRQoL through SOC.

This study has some limitations that should be acknowledged. First, the indicators of social capital used in this study may not fully represent the construct. However, the social capital indicators adopted in this study have been widely used and are considered valid measures according to previous studies (Paxton 1999; Aida et al. 2008; Rostila 2011). Second, some adolescents were evaluated in the follow-up before and others during the COVID-19 pandemic, which can introduce some response bias (Brondani et al. 2021). However, sensitivity analyzes showed that this concern might not affected our findings. Another limitation is the low Cronbach's alpha found for the latent variable of individual social capital. However, important aspects such as the standardized coefficient (>0.30) and the Kaiser-Meyer-Olkin (KMO) (>0.60) test demonstrated acceptable values for the maintenance of this factor (Kline 2011). Finally, only SOC was used to represent the theoretical psychosocial pathway between social capital and oral health. Other psychosocial factors, such as fear/anxiety, oral health values, beliefs, attitudes, that might also act as mediators in the above-mentioned relationship should be examined in future research. Furthermore, use of dental services was self-reported by participant’s caregivers, which may be subject to information bias.

This is a long-term prospective cohort study with a cohort retention rate of 67.1% after 10 years, indicating the validity of our findings. Moreover, this study represents a longitudinal examination of the theoretical pathways between social factors and oral health outcomes during the transition from childhood to adolescence. This transition period is characterized by many changes and adaptative processes that can increase the susceptibility to risk factors which may remain throughout the life span.

Our findings showed that social capital at the community level had a strong and direct impact on dental caries and OHRQoL from childhood to adolescence. Individuals who lived in communities with high social capital at baseline presented lower levels of untreated dental caries and better OHRQoL after 10 years. The impact of community social capital on dental

caries over time was also mediated by psychosocial, behavioural, and use of dental services pathways. In addition, individual social capital indicators at follow-up indirectly influenced untreated dental caries and OHRQoL through the psychosocial pathway.

Findings implications for policy, practice, education and research

Our findings provide evidence for the development and evaluation of oral health promotion actions focusing on distal factors with the aim to reduce the impact of social inequalities on oral health in children and adolescents. Therefore, interventions aiming to improve social networks and trust among individuals may improve their oral health. Furthermore, incentive for implementation of formal institutions in neighbourhoods may also be relevant for the oral health promotion of their residents. Interventions focusing on enhancing sense of coherence may also be relevant, since this seems a relevant psychosocial predictor and mediator of oral health during childhood and adolescence.

Study highlights

- Social capital at the community level exerts a stronger impact on oral health outcomes from childhood to adolescence;
- The association between individual social capital and oral health outcomes was mediated especially through the psychosocial pathway.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

Authors contributions

Ms Knorst designed the study, designed the data collection instruments, collected data, carried out the analyses, drafted and revised the manuscript. Ms Brondani designed the study, collected data and revised the manuscript. Dr Vettore and Dr Hesse conceptualized and designed the study and critically reviewed the manuscript. Dr Mendes and Dr Ardenghi conceptualized and designed the study, coordinated and supervised data collection and critically reviewed the

manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Figure legends

Figure 1. Significant pathways of the final structural model among social capital variables and oral health conditions over time

Table 1. Sociodemographic, psychosocial, behavioural characteristics, and oral health measures at baseline (T1) and at the follow-ups (T2 and T3) of the participants followed over the 10-year cohort.

Variables	**Children followed over 10 years**	
Baseline - 2010 (T1)	**N = 429**[*]	**p-value**[†]
Sociodemographic variables		
Sex [n (%)]		0.227
Girls	209 (49.8)	
Boys	220 (50.2)	
Skin colour [n (%)]		0.158
White	330 (74.3)	
Non-white	99 (25.7)	
Household income in R$ [n (%)]		0.109
Quartile 1 Lowest	90 (17.2)	
Quartile 2	117 (34.4)	
Quartile 3	125 (30.9)	
Quartile 4 Highest	74 (17.6)	
Individual social capital		
Frequency of religious meeting attendence [n (%)]		0.161
At least once a month	248 (58.7)	
Less than once a month or never	181 (41.3)	
Member of voluunter group [n (%)]		0.626
Yes	74 (21.0)	
No	353 (79.0)	
Member of community group [n (%)]		0.104
Yes	72 (17.6)	
No	354 (82.4)	
School involviment [n (%)]		0.352
Yes	172 (40.6)	
No	252 (59.4)	
Community social capial		
Number of churches [mean (SE)]	2.9 (0.1)	0.195
Number of dental workers [mean (SE)]	11.6 (1.4)	0.709
Number of social class associations [mean (SE)]	0.7 (0.1)	0.338
Psychosocial variable		
OHRQoL [mean (SE)]	2.5 (0.3)	0.486
Oral health variable		
Dental caries [mean (SE)]	6.1 (0.4)	0.737
Follow-up - 2017 (T2)		
Behavioral variables		
Daily frequency of tooth brushing [mean (SE)]	2.1 (0.1)	0.473
Dental visits in the last year [mean (SE)]	0.5 (0.1)	0.491
Oral health variable		
Untreated dental caries [mean (SE)]	2.7 (0.2)	0.390
Follow-up - 2020 (T3)		
Socioeconomic variable		

Household income in R$ [n (%)]		0.300
Quartile 1 Lowest	110 (29.2)	
Quartile 2	79 (23.4)	
Quartile 3	108 (25.4)	
Quartile 4 Highest	77 (21.9)	
Individual social capital		
Social network [n (%)]		0.279
Yes	126 (31.4)	
No	303 (68.6)	
Social trust [n (%)]		0.119
Yes	202 (48.7)	
No	223 (51.3)	
Psychosocial and behavioral variables		
Sense of coherence - SOC-13 [mean (SE)]	36.3 (0.6)	0.202
OHRQoL [mean (SE)]	11.1 (0.6)	0.821
Daily frequency of tooth brushing [mean (SE)]	2.3 (0.1)	0.001
Dental visits in the last year [mean (SE)]	1.2 (0.1)	0.574
Oral health variable		
Untreated dental caries [mean (SE)]	0.9 (0.1)	0.050

*Taking into account the sampling weights; Values lower than 429 due to missing data [household income T1 (n=406 and T3 (n=374), member of volunteer group T1 (n=427), member of community group T1 (n=426), school involviment T1 (n=424) and social trust T3 (n=425)]. †p-value refers to the comparison between participants in the follow-up and dropouts, and between individuals evaluated before and during the COVID-19 pandemic; R$, Brazilian Real (US$1.00 is equivalent to R$5.4 approximately); SE, standard error; OHRQoL, oral health-related quality of life.

Table 2. Standardized effects among the variables of social capital and oral health conditions in the initial and final structural model

Pathway to	Full model		Parsimonious model	
	β (SE)	p-value	β (SE)	p-value
OHRQoL (T3)				
Community social capital (T1)	-0.10 (0.04)	<0.05	-0.10 (0.04)	**<0.05**
Individual social capital (T1)	0.06 (0.07)	0.309	0.06 (0.07)	0.309
OHRQoL (T1)	0.00 (0.04)	0.844	0.00 (0.04)	0.844
Skin colour (T1)	-0.04 (0.04)	0.231	-0.04 (0.04)	0.231
Dental visits in the last year (T2)	0.02 (0.04)	0.645	0.02 (0.04)	0.645
Frequency of tooth brushing (T2)	-0.02 (0.04)	0.596	-0.02 (0.04)	0.596
Household income (T3)	-0.09 (0.05)	0.071	-0.09 (0.05)	0.071
Social network (T3)	-0.01 (0.04)	0.679	-0.01 (0.04)	0.679
Social trust (T3)	-0.01 (0.04)	0.731	-0.01 (0.04)	0.731
Untreated dental caries (T3)	0.11 (0.04)	<0.01	0.11 (0.04)	**<0.01**
Dental visits in the last year (T3)	0.09 (0.04)	<0.05	0.09 (0.04)	**<0.05**
Frequency of tooth brushing (T3)	-0.11 (0.04)	<0.01	-0.11 (0.04)	**<0.01**
Sense of coherence (T3)	-0.51 (0.03)	<0.01	-0.51 (0.03)	**<0.01**
Untreated dental caries (T3)				
Community social capital (T1)	-0.12 (0.05)	<0.05	-0.12 (0.05)	**<0.05**
Individual social capital (T1)	-0.10 (0.07)	0.163	-0.10 (0.07)	0.163
Untreated dental caries (T1)	0.04 (0.04)	0.285	0.04 (0.04)	0.285
Sex (T1)	-0.06 (0.04)	0.133	-0.06 (0.04)	0.133
Skin colour (T1)	-0.03 (0.04)	0.498	-	
Dental visits in the last year (T2)	-0.03 (0.04)	0.524	-0.03 (0.04)	0.524
Frequency of tooth brushing (T2)	-0.17 (0.04)	0.719	-0.17 (0.04)	0.719
Untreated dental caries (T2)	0.35 (0.04)	<0.01	0.35 (0.04)	**<0.01**
Household income (T3)	-0.16 (0.05)	<0.01	-0.16 (0.05)	**<0.01**
Social network (T3)	0.02 (0.04)	0.625	0.02 (0.04)	0.625
Social trust (T3)	-0.13 (0.04)	<0.05	-0.13 (0.04)	**<0.05**
Dental visits in the last year (T3)	-0.02 (0.04)	0.533	-0.02 (0.04)	0.533
Frequency of toothbrushing (T3)	0.04 (0.04)	0.377	0.04 (0.04)	0.377
Sense of coherence (T3)	0.00 (0.04)	0.836	0.00 (0.04)	0.836
Sense of coherence (T3)				
Community social capital (T1)	-0.07 (0.05)	0.124	-0.07 (0.05)	0.129
Individual social capital (T1)	0.06 (0.06)	0.444	0.06 (0.04)	0.403
Sex (T1)	-0.23 (0.04)	<0.01	-0.23 (0.04)	**<0.01**
Household income (T3)	0.06 (0.04)	0.214	0.06 (0.05)	0.192
Social network (T3)	0.09 (0.04)	<0.05	0.09 (0.04)	**<0.05**
Social trust (T3)	-0.16 (0.04)	<0.01	-0.16 (0.04)	**<0.01**
Dental visits during the last year (T3)				
Community social capital (T1)	0.06 (0.04)	0.169	0.09 (0.05)	0.07
Individual social capital (T1)	-0.09 (0.07)	0.245	-0.14 (0.07)	0.05
Sex (T1)	0.05 (0.04)	0.217	0.07 (0.04)	0.12
Dental visits during the last year (T2)	0.26 (0.04)	<0.01	0.26 (0.04)	**<0.01**
Household income (T3)	0.14 (0.05)	<0.05	0.16 (0.05)	**<0.05**
Social network (T3)	-0.03 (0.04)	0.489	-0.02 (0.04)	0.59
Social trust (T3)	-0.02 (0.04)	0.984	-	
Frequency of toothbrushing (T3)				

Community social capital (T1)	-0.03 (0.05)	0.557	-0.00 (0.05)	0.498
Individual social capital (T1)	0.10 (0.07)	0.157	0.06 (0.07)	0.224
Sex (T1)	0.17 (0.04)	<0.05	0.18 (0.04)	**<0.05**
Frequency of toothbrushing (T2)	0.19 (0.04)	<0.01	0.19 (0.04)	**<0.01**
Household income (T3)	0.08 (0.05)	0.125	0.10 (0.05)	**<0.05**
Social network (T3)	-0.03 (0.04)	0.880	-	
Social trust (T3)	0.01 (0.04)	0.413	-	
Social network (T3)				
Household income (T3)	0.04 (0.05)	0.361	-	
Sex (T1)	-0.02 (0.04)	0.595	-	
Individual social capital (T1)	0.03 (0.07)	0.632	0.01 (0.07)	0.951
Social trust (T3)				
Social network (T3)	-0.04 (0.04)	0.410	-	
Household income (T3)	-0.12 (0.05)	<0.05	-0.12 (0.05)	**<0.01**
Sex (T1)	0.06 (0.04)	0.159	0.06 (0.04)	0.156
Individual social capital (T1)	0.05 (0.07)	0.474	0.05 (0.07)	0.484
Household income (T3)				
Household income (T1)	0.57 (0.03)	<0.01	0.57 (0.03)	**<0.01**
Dental visits during the last year (T2)				
Community social capital (T1)	0.03 (0.05)	0.437	0.03 (0.05)	0.437
Individual social capital (T1)	-0.16 (0.08)	0.050	-0.16 (0.08)	0.050
Household income (T1)	0.12 (0.05)	<0.05	0.12 (0.05)	**<0.05**
Sex (T1)	0.13 (0.04)	<0.01	0.13 (0.04)	**<0.01**
Frequency of toothbrushing (T2)				
Community social capital (T1)	-0.00 (0.05)	0.851	-0.00 (0.05)	0.851
Individual social capital (T1)	0.01 (0.08)	0.983	0.01 (0.08)	0.983
Household income (T1)	0.08 (0.05)	0.133	0.08 (0.05)	0.133
Sex (T1)	0.05 (0.04)	0.239	0.05 (0.04)	0.239
Untreated dental caries (T2)				
Community social capital (T1)	-0.11 (0.05)	<0.05	-0.11 (0.05)	**<0.05**
Individual social capital (T1)	-0.01 (0.08)	0.904	-0.01 (0.08)	0.904
Household income (T1)	-0.12 (0.05)	<0.05	-0.12 (0.05)	**<0.05**
Untreated dental caries (T1)	0.01 (0.04)	0.803	0.01 (0.04)	0.803
Frequency of toothbrushing (T2)	-0.19 (0.04)	<0.01	-0.19 (0.04)	**<0.01**
Household income (T1)				
Skin colour (T1)	-0.16 (0.03)	<0.01	-0.16 (0.03)	**<0.01**
Community social capital (T1)	0.15 (0.04)	<0.01	0.15 (0.04)	**<0.01**
Individual social capital (T1)	-0.29 (0.06)	<0.01	-0.29 (0.06)	**<0.01**
Untreated dental caries (T1)				
Household income (T1)	-0.22 (0.04)	<0.01	-0.22 (0.04)	**<0.01**
Sex (T1)	-0.05 (0.03)	0.188	-	
Community social capital (T1)	-0.10 (0.04)	<0.05	-0.10 (0.07)	**<0.05**
Individual social capital (T1)	-0.17 (0.07)	<0.05	-0.17 (0.07)	**<0.05**
OHRQoL (T1)				
Household income (T1)	-0.11 (0.05)	<0.05	-0.11 (0.05)	**<0.05**
Untreated dental caries (T1)	0.22 (0.04)	<0.01	0.22 (0.04)	**<0.01**
Sex (T1)	-0.01 (0.04)	0.921	-	
Community social capital (T1)	-0.04 (0.05)	0.331	-0.04 (0.05)	0.331
Individual social capital (T1)	-0.12 (0.08)	0.123	-0.12 (0.08)	0.123

Model Fit		
RMSEA (90% CI)	0.02 (0.01-0.03)	0.02 (0.01-0.03)
CFI	0.94	0.95
TLI	0.92	0.93

T1, baseline; T2, follow-up 2017; T3, follow-up 2020; β, beta coefficient; SE, standard error; OHRQoL, oral health-related quality of life; RMSEA, Root Mean Square Error of Approximation; CI, Confidence interval; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index.

Table 3. Standardized coefficients of the direct, indirect and total effects of the social capital variables on dental caries and OHRQoL at baseline and follow-ups

Pathways from…	**Direct effects**	**Indirect effects**	**Total effects**
Community social capital (T1) to untreated dental caries (T1)	-0.15*		-0.20*
Via household income (T1)		-0.05*	
Community social capital (T1) to untreated dental caries (T3)	-0.84*		-1.36*
Via frequency of toothbrushing (T2 and T3) -> Via use of dental services (T2 and T3) -> Via sense of coherence (T3)		-0.52*	
Individual social capital (T1) to untreated dental caries (T1)	-0.13		-0.08
Via household income (T1)		0.05	
From ISC (T1) to untreated dental caries (T3)	-0.38		-0.25
Via frequency of toothbrushing (T2 and T3) -> Via use of dental services (T2 and T3) -> Via sense of coherence (T3)		0.13	
Community social capital (T1) to OHRQoL (T1)	-0.62		-1.26
Via household income (T1) -> Untreated dental caries (T3)		-0.64*	
Community social capital (T1) to OHRQoL (T3)	-2.15*		-2.60*
Via frequency of toothbrushing (T2 and T3) -> Via use of dental services (T2 and T3) -> Via sense of coherence (T3)		-0.45	
Individual social capital (T1) to OHRQoL (T1)	-0.85		-0.78
Via household income (T1) -> Untreated dental caries (T3)		0.07	
Individual social capital (T1) to OHRQoL (T3)	0.14		0.41
Via sense of coherence (T3)		-0.55	
Social trust (T3) to untreated dental caries (T3)	-0.44*		-0.45*
Via sense of coherence (T3)		-0.01	
Social trust (T2) to OHRQoL (T3)	-0.18		0.66
Via sense of coherence (T3)		0.85*	
Social network (T3) to untreated dental caries (T3)	0.13		0.14
Via sense of coherence (T3)		0.01	
Social network (T3) to OHRQoL (T3)	-0.40		-1.60
Via sense of coherence (T3)		-1.20*	

T1, baseline; T2, follow-up 2017; T3, follow-up 2020; OHRQoL, oral health-related quality of life; *p<0.05

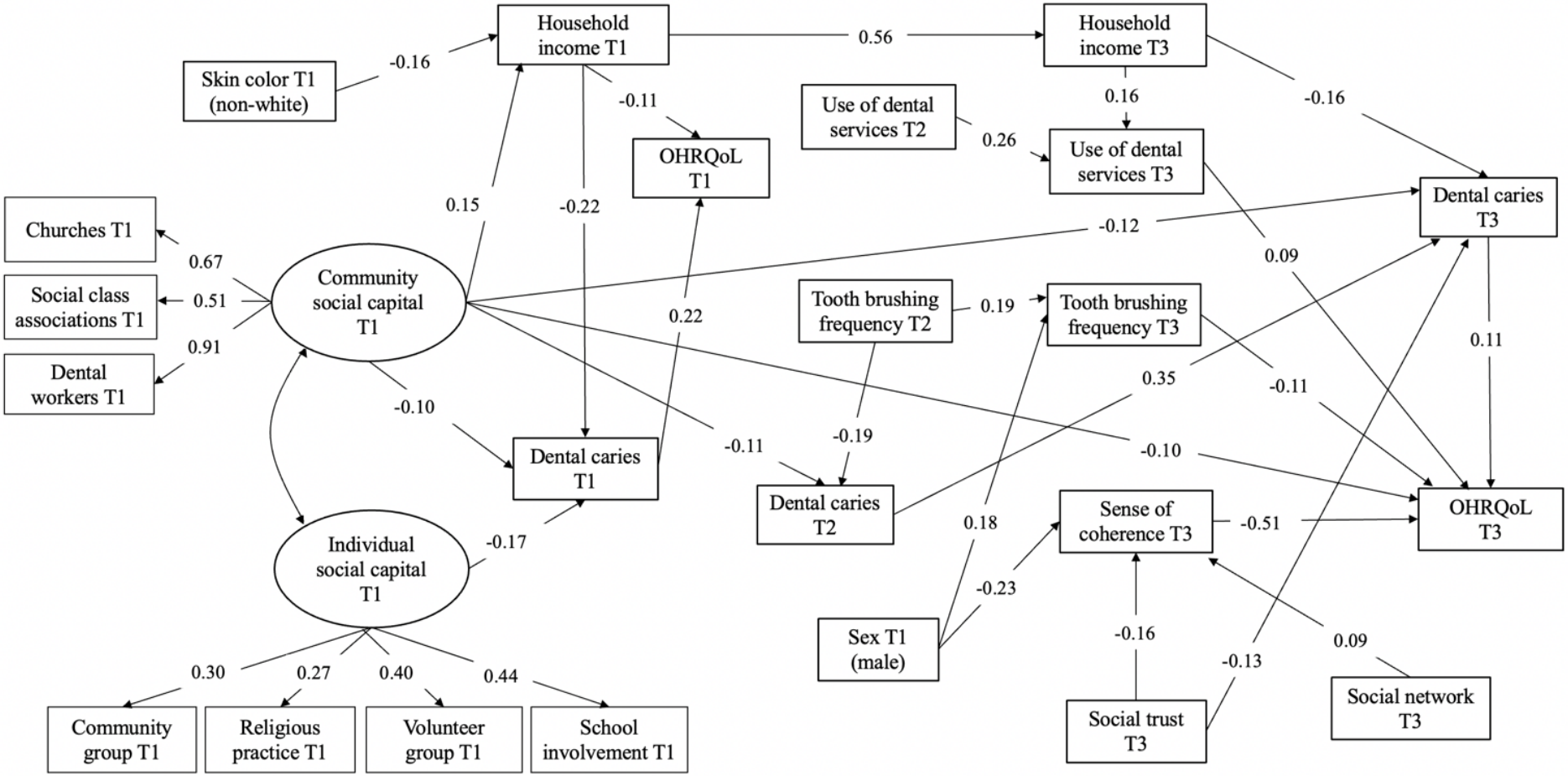
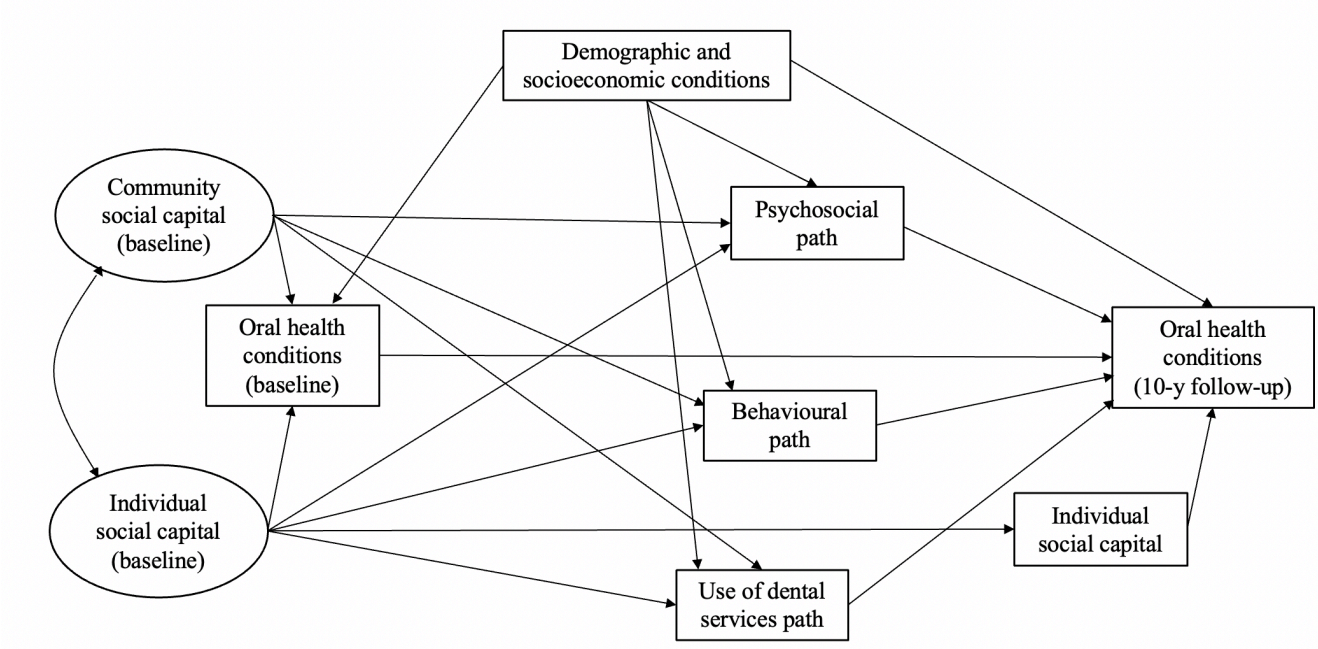


Figure 1. Significant pathways of the final structural model among social capital variables and oral health conditions over time

Supplementary Table 1. Confirmatory factor analysis of individual and contextual social capital latent variables at baseline (T1)

	Factor-1 Contextual Social Capital		**Factor-2 Individual Social Capital**	
Variables	λ^*	δ	λ	δ
Churches in the neighbourhood (i1)	0.69	0.51		
Dental workers in the neighbourhood (i2)	0.75	0.43		
Social class associations in the neighbourhood (i3)	0.54	0.70		
Frequency of attending religious meeting (i4)			0.27	0.82
Member of voluunter group (i5)			0.42	0.78
Member of community group (i6)			0.46	0.91
School involvment (i7)			0.30	0.92
Model Fit				
Cronbach's alpha	0.73		0.40	
RMSEA (90% CI)	0.02 (0.01 - 0.04)			
CFI	0.99			
TLI	0.99			

λ, Loadings; δ, Uniqueness; *Showing only loading >0.30; RMSEA, Root Mean Square Error of Approximation; CI, Confidence interval; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index.



Supplementary Figure 1. Theoretical model used in this study based on the conceptual framework of the Commission on Social Determinants of Health (Solar and Irwin 2010) and on the model proposed by Rouxel et al. (2015).

Supplementary Text 1. Expanded methodology

Study design and sampling process

This study was a 10-year prospective cohort study involving preschool children from Santa Maria, a southern city in Brazil. The city had an estimated population of 263,403 inhabitants in 2010, which included 27,520 children under 6 years of age. The cohort study involved the baseline and three follow-up assessments in the years 2012 (2 years), 2017 (7 years), and 2020 (10 years). The present study included data from children and their parents evaluated at baseline in 2010 (T1) and followed up in 2017 (T2) and 2020 (T3). The research protocol was approved by the Research Ethics Committee of the Federal University of Santa Maria (protocol CAAE 11765419.1.0000.5346). All participants agreed to participate and their parents signed an informed consent form before data collection in all phases of the study.

A systematic probabilistic sample was selected involving all children aged from 1 to 5 years who attended primary healthcare units in the city of Santa Maria during the National Children's Vaccination Day in 2010. Children with any physical or mental disabilities were not included. The primary sampling units were all 15 health care centres in the city that had dental chairs. The health care centres were well distributed across the different regions of the city, encompassing neighbourhoods with different socioeconomic backgrounds. Further details on the methodology used in T1 were published elsewhere (Piovesan et al. 2013).

The sample size calculation of the present study considered a standard error of 5%, confidence level of 95%, minimum effect size of 0.2 (Fontanini et al. 2015), two latent variables, 13 observed variables, and statistical power of 80% for structural equation modelling (SEM) analysis. Considering a design effect of 1.2 and adding 30% for possible anticipated losses, the minimum required sample size was 335 children.

Follow-up assessment

All participants at baseline examination were invited for a further assessment after 7 (T2) and 10 years (T3). The children's age ranged from 8 to 12 years at T2 and from 11 to 15 years at T3. Data collection at first follow-up (T2) was carried out from January 2017 to March 2018. The second follow-up (T3) data collection period started in November 2019, which was interrupted in March 2020 due to the COVID-19 pandemic. Thereafter, with all appropriate measures, the continuation of this stage took place between October 2020 and January 2021.

Data collection at T2 and before the COVID-19 pandemic at T3 included different approaches in order to reach the participants. The primary strategy was through visits at the

school where the adolescents were enrolled to perform the follow-up evaluations. At least five school visits attempts were conducted until considering the participant as lost to follow-up. Another approach was through home visits which were arranged via telephone with the participants' parents to confirm the household address and to schedule the second assessment. A further procedure to contact the participants included the use of online social networks of the adolescents and their parents, such as Facebook and WhatsApp. The two latter strategies of follow up recruitment and home visits assessments were predominant when the schools closed due to the COVID-19 pandemic. The researchers also visited the participants' households using the addresses information registered in the baseline questionnaires when the former strategies failed.

Data collection and variables

Data were collected through self-administered questionnaires, interviews, and oral examinations. All data collection procedures were in accordance with the standardized criteria for oral health surveys and validated methods to assess the non-clinical measures as detailed below (Chor et al 2001; Ismail et al. 2007; Torres et al. 2009; Scarpelli et al. 2011; World Health Organization 2013; Menegazzo et al. 2020).

Dental caries was evaluated at T1, T2 and T3 using the diagnostic criteria of the International Caries Detection and Assessment System (ICDAS) (Ismail et al. 2007). The dental exams were performed using a plain dental mirror (Golgran, São Caetano, Brazil) and CPI "ball point" periodontal probes (Golgran, São Caetano, Brazil). At T1, children were examined in the dental chairs at the healthcare centres after dental prophylaxis using artificial lighting and gauze. Participants were evaluated at T2 and T3 in their homes or at the schools under natural light using the same dental instruments. For the purpose of analysis, dental caries was assessed according to the number of teeth with the presence of untreated dental caries (ICDAS codes 3, 5 or 6).

The clinical examiners were dentists previously trained and calibrated according to the methodology proposed by the World Health Organization manual for epidemiological surveys (World Health Organization 2013), totalling 36 hours. Initially, one experienced dental researcher ministered a theoretical training about the use of ICDAS to assess dental caries. Subsequently, each examiner independently evaluated photographic images representing the ICDAS codes, and performed the clinical-epidemiological exercise using 20 exfoliated primary teeth. For clinical training and calibration, 20 children who did not participate in the main study were examined twice at 7-day interval. A total of 15, 4 and 7 examiners were calibrated and

conducted clinical examinations at baseline (T1) and follow-ups (T2 and T3), respectively. At T1, inter-and intraexaminer kappa coefficients for the ICDAS scores ranged from 0.70 to 0.89 and from 0.70 to 0.96, respectively. At T2, inter-and intraexaminer kappa coefficients ranged from 0.74 to 1.00 and from 0.72 to 0.95, and at T3, from 0.81 to 0.92 and from 0.70 to 0.76.

Table. Inter and intra-examiners kappa values according to each cohort wave

Cohort wave	**Kappa values**	
	Inter-examiner	**Intra-examiner**
2010 – T1		
Examiner 1	0.86	0.70
Examiner 2	0.78	0.70
Examiner 3	0.85	0.70
Examiner 4	0.87	0.71
Examiner 5	0.85	0.70
Examiner 6	0.89	0.71
Examiner 7	0.78	0.70
Examiner 8	0.82	0.81
Examiner 9	0.75	0.79
Examiner 10	0.72	0.96
Examiner 11	0.71	0.86
Examiner 12	0.70	0.80
Examiner 13	0.70	0.90
Examiner 14	0.70	0.77
Examiner 15	0.77	0.94
2017 – T2		
Examiner 1	1.00	0.95
Examiner 2	0.92	0.95
Examiner 3	0.74	0.82
Examiner 4	0.70	0.72
2020 – T3		
Examiner 1	0.87	0.76
Examiner 2	0.81	0.70
Examiner 3	0.86	0.70
Examiner 4	0.92	0.72
Examiner 5	0.86	0.70
Examiner 6	0.89	0.71
Examiner 7	0.90	0.70

Different instruments were used to assess OHRQoL in each wave due to the long follow-up period of the study and consequently the discrepancies of the participant's age between T1 and T2. Accordingly, OHRQoL was assessed using the most appropriate instrument in each period of evaluation considering the participant's age. OHRQoL was evaluated using the

Brazilian version of the Early Childhood Oral Health Impact Scale (ECOHIS) at T1, applied to children's parents or guardians (Scarpelli et al. 2011). The ECOHIS is composed of 13 items and subdivided into 2 sessions. One refers to children's impact and the other is related to family's impact. Each item is responded using a Likert scale ranging from 0 to 5 points: (0) never, (1) almost never, (2) occasionally, (3) often, (4) very often, and (5) don't know. The responses codes with "don't know" were considered missing data. For those with up to 2 missing responses in the child section or one in the family section, a score for the missing items was imputed as a mean of items for that section (Scarpelli et al. 2011). Parents with missing responses in more than two child items and one family item were excluded. The total sum of the scores ranges from 0 to 52. The adolescents completed the reduced Brazilian version of the Child Perceptions Questionnaire 11-14 (CPQ11-14) (Torres et al. 2009) at T3. The short version of CPQ11-14 has 16 questions, grouped into four domains: oral symptoms, functional limitation, social well-being, and emotional well-being. Each item is assessed using a Likert scale from 0 to 4 points: (0) never; (1) once or twice; (2) sometimes; (3) often; and (4) every day/almost every day. The total sum of the scores ranges from 0 to 64 points. In both questionnaires, the higher the score, the worse the OHRQoL. The total scores were used in the statistical analysis.

Individual and community social capital were evaluated at T1 and T3. Social capital is characterized as the quantity and quality of resources or benefits that an actor (individual, group or community) can access according to their position in a social network (Putnam 1993; Rostila et al. 2011). However, the concept of social capital is still in debate in the literature, since it cannot be measured directly, but only inferred from its determinants or manifestations (Rostila 2011). The determinants of social capital are factors that influence social interactions, allowing their formation, and the manifestations are the results of it (Rostila 2011). Thus, social capital is commonly measured through indicators or "proxies", which are theoretically linked to its concept (Paxton 1999; Rostila 2011). Commonly used individual indicators refer to social participation, social support or social networks, such as close contact with friends and family members, religious participation, and social trust (Paxton 1999; Chor et al 2001; Fontanini et al. 2015; Knorst et al. 2019; Ferreira et al. 2019; Ferreira et al. al. 2021). The assessment of community-level social capital may include indicators of community social networks such as the number of worker associations, volunteers, community cultural centers, churches and parks (Paxton 1999; Aida et al. 2008; Knorst et al. al. 2019; Ferreira et al. 2021).

Individual social capital at T1 was measured through social networks of the participants' caregivers through the following questions: "How often do you attend religious meetings" (0)

at least once a month or (1) less than once a month or never; “Do you participate in any volunteer groups?” (0) yes or (1) no; “Do you participate in any community groups?” (0) yes or (1) no; and “Do you participate in your child's school activities?” (0) yes or (1) no. Individual social capital at T2 was evaluated according to adolescents’ social networks and social trust using the following questions: "Do you attend any volunteer group?" (0) yes or (1) no; and "Do you think your friends and neighbours can be trusted?” (0) yes or (1) no. About 95% of the social capital questions were answered by the child's mother, and the remainder by the father or other caregiver. Variables related to social relationships, social trust, and social support surrounding the individual have been considered as proxy measures of social capital, and are commonly used indicators in previous literature (Chor et al. 2001; Fontanini et al. 2015; Ferreira et al. 2021; Paxton et al. 1999).

Community social capital at T1 was assessed according to the presence of community cultural centres, number of dental workers and number of churches in the neighbourhood where the participants used to live at baseline, totalling 15 neighbourhoods. Characteristics of the neighbourhood, such as number of workers (Paxton et al. 1999; Aida et al. 2008), provision of health services (Kowitt et al. 2015), and number of religious buildings (e.g. churches) (Ferreira et al. 2021), have been associated with community social capital and social cohesion. The information of the neighbourhoods was gathered from official documents and publications obtained from the local city hall. All the 15 selected neighbourhoods belonged to the same municipality. These neighbourhoods were well distributed across different administrative regions of the city and their territorial size ranged from 0.4821 km² to 20.3463 km², whereas the population ranged from 1,347 to 21,822 inhabitants (IBGE 2010). As the neighbourhoods presented different population sizes, the probability proportional size selection method was used for the sample selection.

The possible mediators between social capital and oral health measures were evaluated according to the pathways proposed in the theoretical model (Rouxel et al. 2015). Sense of coherence (SOC) was evaluated at T3 to represent aspects of the psychosocial pathway. The adolescents answered the short version of the 13-item SOC scale (SOC-13), originally developed by Antonovsky (1987) and validated thereafter for Brazil (Menegazzo et al. 2020). The questions are divided into comprehensibility, manageability, and meaning components. The items are followed by a 5-point Likert scale. The items are added to obtain the final score, which may range from 13 to 65 points. Higher scores represent a higher SOC.

Frequency of dental visits and frequency of toothbrushing were assessed at T2 and T3, and were used to evaluate use of dental services and health behaviours pathways, respectively.

Use of dental services was assessed according to the methodology proposed by the WHO for oral health surveys, using the following question: “In the last year (12 months), how many times have you been to the dentist?”, since individuals who visited the dentist at least once in the last year are considered regular users (World Health Organization 2013). Frequency of toothbrushing was measured according to the number of times the individuals brushed their teeth daily. These measures were used as count variables.

Demographic data, including sex (girls or boys) and skin colour, and socioeconomic status were measured at T1 and T3 as covariates. Skin colour was evaluated using the criteria established by the Brazilian Institute of Geography and Statistics (IBGE) (IBGE 2010) according to the question: “What’s your child skin colour? (0) white; (1) brown; (2) black; (3) yellow or (4) indigenous?”. For data analysis, the variable was dichotomized into whites (0) and non-whites (1, 2, 3 or 4). Family income in the previous month was used to measure socioeconomic status (Galobardes et al. 2007), corresponding to the sum of salaries, pensions, government benefits, and so on. The variable was collected in Brazilian Reais (US$1.00 is equivalent to R$5.4 approximately), and were later categorized into quartiles of family income, from Quartile 1 – ‘Lowest income’ to Quartile 4 – ‘Highest income’. The cut-off of the lowest income group (quartile 1) corresponded to one Brazilian Minimum Wage (BMW), which was equivalent to US$95 in 2010 (baseline) and US$200 in 2020.

Statistical analysis

The data were analysed using the STATA 14 program (Stata Corporation, College Station, TX, USA). Descriptive analysis of the characteristics of the sample at T1, T2 and T3 was performed. Data between individuals who were assessed at T2 and dropouts, and between individuals at T2 evaluated before and during the COVID-19 pandemic were compared using the Chi-square test (qualitative variables) and the *t*-test (quantitative variables). Sensitivity analysis between groups was performed by Bootstrap simulation. Analyses were conducted considering the sampling weights ('svy' command) for complex data samples.

Structural equation modelling (SEM) was used to assess the associations of individual and community social capital (as the main predictors) with normative (dental caries) and subjective (OHRQoL) oral health outcomes over time. The theoretical model used in this study was based on the conceptual framework of the Commission on Social Determinants of Health (Solar and Irwin 2010) and on the model proposed by Rouxel et al. (2015) (Rouxel et al. 2015) where the pathways by which individual and community social capital can affect oral health are hypothesized (Supplementary Figure 1).

Confirmatory factor analysis (CFA) was used to assess the measurement model through testing the multidimensionality of the latent variables and the correspondence with the indicators. The latent variable of community social capital at T1 was evaluated by four observed indicators: religious attendance, participation in voluntary groups, participation in community groups, and involvement in the child's school activities. The indicators number of churches, class associations, and dental workers in the neighbourhood composed the latent variable of community social capital at T1. In the next step, structural equation modelling (SEM) assessed the magnitude of the direct and indirect relationships between latent and observed variables according to the theoretical model. The total, direct (a direct path from one variable to another) and indirect (a pathway mediated by other variables) effects between variables were estimated.

The Maximum Likelihood with Missing Values (MLMV) estimation method was used in CFA and SEM analysis. Modification Indices (MI) >10 and non-significant paths ($p<0.25$) were used to evaluate the full model and to remove the non-significant pathways to estimate the parsimonious model. The goodness-of-fit was measured using Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). The RMSEA value <0.05 and CFI and TLI >0.90 denotes an adequate model fit (Kline 2010). The results were presented using standard coefficients (β), standard errors (SE) and p-values.

Supplementary Text 2. STROBE Checklist

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	**Recommendation**	
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	"This 10-year prospective cohort started in 2010 with a sample of 639 preschoolers aged 1-5 years from the southern Brazil."
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	This information is in the abstract as requested.
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	This information is presented in the Introduction section

			with emphasis in the third and fourth
Objectives	3	State specific objectives, including any prespecified hypotheses	"This study aimed to explore the pathways by which individual and community social capital can influence the clinical measures (dental caries) and PROMs (OHRQoL) from childhood to adolescence. We hypothesized that high individual and community social capital at baseline would directly predict lower dental caries and better OHRQoL at 10-year follow-up. Moreover, indirect effects of individual and community social capital at baseline on dental caries and OHRQoL at 10-year follow-up via psychosocial, behavioral, and use of oral health services pathways were also hypothesized."
Methods			
Study design	4	Present key elements of study design early in the paper	"This study was a 10-year prospective cohort study involving preschool children from Santa Maria, a southern city in Brazil."
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	All these data can be found in the second, third and fourth paragraph of the Material and methods section.
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	"A systematic probabilistic sample was selected involving all children aged from

			1 to 5 years-old who attended primary healthcare units in the municipality on the National Children's Vaccination Day in 2010. Children with any physical or mental disabilities were not included. The primary sampling units included all 15 health care centres in the city that had dental chairs."
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	Not applicable.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	These data are presented in Data collection - Material and methods section.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	These data are presented in Data collection - Material and methods section.
Bias	9	Describe any efforts to address potential sources of bias	These data are presented in Data collection - Material and methods section (such as calibration, and so on).
Study size	10	Explain how the study size was arrived at	"The sample size calculation of the present study considered a standard error of 5%, confidence level of 95%, minimum effect size of 0.2 (Fontanini et al. 2015), two latent variables, 10 observed variables, and statistical power of 80% for structural equation modelling (SEM) analysis.

			Considering a design effect of 1.4 and adding 30% for possible anticipated losses, the minimum required sample size was 406 children.”
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	These data are found in variables description in Material and methods section.
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	These data can be found in Statistical analysis - Material and methods section.
		(*b*) Describe any methods used to examine subgroups and interactions	These data can be found in Statistical analysis - Material and methods section..
		(*c*) Explain how missing data were addressed	Individuals with missing data were excluded at the follow-up stage.
		(*d*) If applicable, explain how loss to follow-up was addressed	These data can be found in the first paragraph of the Results section.
		(*e*) Describe any sensitivity analyses	Not applicable.
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	“Of the 639 children assessed at baseline, a total of 449 were re-evaluated at 10-year follow-up (a 67.1% cohort retention rate).”
		(b) Give reasons for non-participation at each stage	“The reasons for losses in the follow-up included the inability to find the individual (n = 184), move to another city (n = 19), and refusal to participate in the follow-up data collection (n = 7).”
		(c) Consider use of a flow diagram	The authors deemed it not necessary to use a flow diagram because

			it is only two exam times considered.
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	These data can be found in the first paragraph of the Results section, and were summarized in Table 1.
		(b) Indicate number of participants with missing data for each variable of interest	Participants with missing data were excluded.
		(c) Summarise follow-up time (eg, average and total amount)	Ten years after the first evaluation.
Outcome data	15*	Report numbers of outcome events or summary measures over time	"Regarding the main outcomes of this study, the mean number of teeth with untreated dental caries was 0.9 (SE 0.1), and the mean overall CPQ11-14 scores were 11.1 (SE 0.6) at follow-up (Table 1)."
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	These data can be found from the third and fourth paragraph onward of the Results section and summarized in Table 2 and 3.
		(*b*) Report category boundaries when continuous variables were categorized	These data are found in the Material and methods section (variables description).
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable.
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable.
Discussion			
Key results	18	Summarise key results with reference to study objectives	"Our findings partially confirmed the pre-established hypotheses. High community social capital at baseline was a relevant determinant

			of lower occurrence of untreated dental caries and better OHRQoL after 10 years.”
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	These data can be found in the sixth paragraph of the “Discussion” section.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	These data can be found in the “Discussion” section.
Generalisability	21	Discuss the generalisability (external validity) of the study results	“Some strengths of this study should also be highlighted. This is a long-term prospective cohort study with a large cohort retention rate (67.1%) after 10 years, indicating the validity of our findings. Moreover, this study represents a longitudinal examination of the theoretical pathways between social factors and oral health outcomes during the transition from childhood to adolescence.”
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	“The Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq – process 160258/2020-0) and Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERPGS – process 17/2551-0001083-3) supported this study.”

5 ARTIGO 3 – SENSE OF COHERENCE MODERATES THE RELATIONSHIP BETWEEN SOCIAL CAPITAL AND ORAL HEALTH-RELATED QUALITY OF LIFE IN SCHOOLCHILDREN: A 10-YEAR COHORT STUDY

Este artigo já está publicado no periódico *Health and Quality of Life Outcomes*, ISSN: 1477-7525, Fator de impacto 3,077 e Qualis A2. First published: 02 April 2022 https://doi.org/10.1186/s12955-022-01965-3. As normas para publicação estão descritas no Anexo H.

Sense of coherence moderates the relationship between social capital and oral health-related quality of life in schoolchildren: a 10-year cohort study

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Abstract

Background: This study aimed to evaluate the moderating effect of sense of coherence (SOC) on the relationship between social capital and oral health-related quality of life (OHRQoL) among schoolchildren.

Methods: A cohort study was conducted in the city of Santa Maria, Brazil, involving children aged 1-5 years at baseline who were reassessed after 10 years in adolescence (11-15 years-old). Social capital was assessed at baseline and follow-up through social networks and social trust. Sense of coherence scale (SOC-13) and the short form of the Child Perceptions Questionnaire 11-14 (CPQ11-14) were measured at 10-years follow-up. Demographic and socioeconomic characteristics, and dental caries were also evaluated. Moderating effect of SOC on the relationship between social capital and OHRQoL was tested using multilevel adjusted Poisson regression analysis and simple slope test.

Results: From the 639 subjects assessed at baseline, 429 were reassessed at follow-up (cohort retention rate 67.1%). Moderate and high levels of SOC demonstrated a moderating effect on the relationship between social capital and OHRQoL. Among individuals who presented low social capital at baseline and follow-up, those who had high SOC reported, respectively, an impact 64% and 70% lower on OHRQoL when compared to those with low SOC. The greatest margin effect was observed in individuals with low social capital and low SOC at follow-up (24.25; $p<0.05$).

Conclusion: Our findings suggest that SOC moderates the negative impact of low social capital on poor OHRQoL in schoolchildren.

Keywords: Brazil; Children; Moderating effect; Oral Health; Quality of life; Sense of coherence; Social Capital.

Introduction

Oral health inequalities remain a worldwide public health problem [1]. Currently, the focus is beyond the clinical measures of the dental diseases, and the patient's self-perception has been considered, especially on how oral health conditions affect their well-being and quality of life [2]. In this context, oral health-related quality of life (OHRQoL) measures have been widely advocated as an adjunct to clinical parameters in public policy planning and in the assessment of oral health strategies [3]. Clinical and socioeconomic conditions have been associated with OHRQoL [4,5]. In addition, contemporary approaches recognize the importance of the salutogenic model [6] and social capital [7] on planning oral health promotion actions and strategies to enhance OHRQoL.

Social capital has been described as the characteristics of the social structure, such as levels of trust and reciprocity, or individual social networks that act as resources accessed by individuals that can facilitate collective action [8,9]. High social capital may act as a protective factor on oral health buffering the effects of stress through the perception of mutual social support, as well as through feelings of security and belonging [10]. Other individual resources, such as sense of coherence (SOC), can also interact with a person's coping style and social capital [11,12]. Moreover, psychosocial mechanisms, including SOC, are central elements in the theoretical pathways developed to explain the relationship between social capital and oral health [10, 11].

SOC is defined as a global orientation that allows people to manage stress, identify their internal and external environments and find solutions for their health [6]. In this sense, SOC variations may explain why some individuals remain healthy even after experiencing stressful circumstances in life [6]. SOC has been associated with different aspects of health and disease. For instance, individuals with high SOC had less dental caries and dental pain [13], as well as better self-perceived health and better OHRQoL [14]. Previous studies have shown a moderating effect of SOC on the association between general quality of life and OHRQoL even when clinical conditions and symptoms were considered [14,15]. In this context, SOC might be an important psychosocial factor that can act as a moderator on the relationship between social capital and oral health outcomes.

The relationship between social life the characteristics, SOC and OHRQoL in children and adolescents has been demonstrated [5,11,16]. However, to our best knowledge, the association between social capital and OHRQoL considering the moderating effect of SOC in these age groups has not yet been explored. Children is a relevant population to investigate the above-mentioned links since SOC is under development until early adulthood [6]. In addition,

SOC can be an important ally to promote effective strategies to improve oral health. Thus, this study aimed to evaluate whether SOC modifies the association between social capital and OHRQoL from childhood to adolescence. We hypothesize that adolescent's OHRQoL are influence by low levels of social capital during childhood and adolescence according to different levels of SOC. It was anticipated that individuals with low social capital and high SOC would have better OHRQoL than those with low social capital and low SOC.

Methods

Ethical aspects

This project was approved by the Research Ethics Committee (CEP) of the Federal University of Santa Maria (protocol CAAE 11765419.1.0000.5346). All participants agreed to participate in the study and their parents signed an informed consent form in both phases of the study.

Study design and participants

This is a cohort study with 10 years of follow-up. Baseline (T1) collection was carried out in 2010 during the National Children's Vaccination Day in Santa Maria, Brazil. The estimated population of the city in 2010 was 263,403 inhabitants, which included 27,520 children up to 5 years old. The recruitment of the sample occurred in all 15 healthcare centres that had a dental office distributed in different neighbourhoods of the city. A systematic approach was adopted to select the children in the vaccination row. About 639 children up to 5 years old were evaluated. Additional information about the sample selection process is available elsewhere [17].

The cohort was followed and participants were reassessed in 2012 (2 years), 2017 (7 years), and 2020 (10 years). This study used data from baseline (T1) and 10-year follow up (T2). Data collection of the latter period was conducted between October 2019 and January 2021. Due to the COVID-19 pandemic, data collection at T2 was interrupted from March to September 2020 [18]. At T2, adolescents were searched at schools where they were enrolled, through telephone calls, and, if necessary, through online social networks such as WhatsApp and Facebook.

A post hoc power calculation was performed considering the final sample size and the estimates obtained from our sample. A sample of 429 participants, alpha error probability of 0.05, mean score of CPQ11-14 of 7.6 (SD = 6.3) for the non-exposed group (high SOC), and mean score of 19.5 (SD = 10.3) for the exposed group (low SOC), resulted in a sample power of 100%.

Data collection and variables

Data was collected at the dental office of the healthcare centres at T1 and at the participant's homes or schools at T2 through clinical examinations and interviews using a structured questionnaire, following the international protocol for health surveys [19-22].

Social capital was evaluated at T1 and T2. In the former period, social capital was measured considering parents/legal guardians social networks using the following questions: a) "How often have you visited friends and neighbours in the last 12 months?"; b) "How often have you visited family members in the last 12 months?"; and c) How often do you participate in group religious activities, with the following response options: (0) at least once a month; (1) less than once a month or never. Social capital was evaluated through adolescent social networks and social trust at T2, using the following questions: a) "How often do you participate in group religious activities" (0) at least once a month or (1) less than once a month or never; b) "Do you participate in any group volunteer work?" (0) yes or (1) no and c) "Do you think your friends and neighbours are trustworthy?" (0) yes or (1) no. The items used to assess social capital at T1 and T2 are considered reliable proxies of social capital according to the literature [5,23]. Participants were classified as with high social capital (at least one source of social network or trust) or low social capital (absence of any source of network or trust) for analytical purposes as previously suggested [24,25].

OHRQoL was assessed at T2 using the short version of the Child Perceptions Questionnaire 11-14 (CPQ11-14). The questionnaire was previously adapted and culturally transcribed for 5-years-old Brazilian children [20]. The short version of CPQ11-14 is composed of 16 questions, grouped into 4 domains: oral symptoms, functional limitation, social well-being, and emotional well-being. Each item is followed by a five-point Likert score: (0) "never"; (1) "once or twice", (2) "sometimes", (3) "often"; and (4) "every day/almost every day". OHRQoL scores are computed by summing code responses with a final score ranging from 0 to 64. The higher the score, the worse the OHRQoL.

Adolescent SOC was assessed according to the Brazilian short version of the SOC-13 scale, originally developed by Antonovsky (1987) [6,21]. The questions are divided into three components: comprehensibility, manageability and meaningfulness. The response options follow a 5-point Likert scale varying from 1 to 5. The first two items of the SOC-13 scale include the following prompts: 1) "What you do daily is…"; and 2) "Until today your life has been…" The response options for the first item vary from (1) "an enormous suffering and annoyance" to (5) "a great pleasure and satisfaction", and from (1) "with no aim" to (5) "full of aims" for the second item. The following items relate to coping in everyday life and the

response options range from (1) “never” to (5) “always”. The last item refers to the perception of the importance given to life events, and the answers can vary from (1) “totally wrong” to (5) “totally right”. The item codes are added to obtain the final score, which can vary from 13 to 65. Higher scores indicate stronger levels of SOC. For data analysis, SOC was categorized using the mean (36.2) and +-1SD (8.0) of the sample, according to previous literature [15]. Thus, the participants were categorized as of low (up to score 28.2), moderate (28.3 to 36.1), and high SOC (from 36.2 onwards).

Sociodemographic characteristics and dental caries were measured at baseline and follow-up as possible confounders. Demographic characteristics included sex (girls or boys) and age (in complete years). Skin colour was self-reported through the question: “What is your / your child race or skin colour?” at T1 (to parents) and T2 (to child), whit the response options: (1) “white”, (2) “brown”, (3) “black”, (4) “yellow” or (5) “indigenous”, according to the criteria proposed by the Brazilian Institute of Geography and Statistics (IBGE) [26]. For data analysis, skin colour was dichotomized as whites (0) or on-whites (2,3,4,5). Maternal education was assessed according to years of schooling completed with approval and dichotomized into < 8 years (up to primary school) or ≥ 8 years (incomplete secondary school or more). Monthly family income in the previous month was collected and categorized as > 1 Brazilian minimum wage (BMW) or ≤ 1 BMW. One BMW corresponded to 200 USD when the data was collected. Dental caries was assessed by the diagnostic criteria of the International Caries Detection and Assessment System (ICDAS) [22]. The number of teeth with untreated dental caries (ICDAS code 3, 5, or 6) was considered in the analysis. Surfaces with ICDAS stages 0, 1, 2 and 4 were classified as caries free. The dental exams were performed under artificial light, using a plain dental mirror, periodontal probe (CPI; “ballpoint”) and gauze. The examiners were previously trained and calibrated (Kappa > 0.70).

Statistical analysis

Data analysis was performed using STATA 14.0 statistical software (StataCorp. 2014. Stata Statistical Software: Release 14.0. College Station, TX: StataCorp L). The comparisons between participants who were assessed at follow up and dropouts, and between individuals assessed before and during the COVID-19 pandemic were evaluated by the chi-square test (qualitative variables) and the t-test (quantitative variables).

The study outcome was OHRQoL measured through the CPQ11-14 total scores. Unadjusted and adjusted Multilevel Poisson regression analysis was performed to evaluate the moderating effect of SOC on the relationship between social capital and OHRQoL. Moderation

effects occur when the relationship between two variables vary according to a third variable, which is referred as the moderator variable. The effect of a moderating variable is statistically characterized as interaction; that is, a variable that affects the direction and/or strength of the association between the dependent and independent variables [27]. Our data was tested in multiplicative interactions scale to verify the modification of the effect, as in previous studies [14,15]. The logic map of the moderation effects is presented in Figure 1. The interaction in different categories was considered as follows: 0= low social capital x low SOC; 1= high social capital x low SOC; 2= high social capital x high SOC; and 3= low social capital x high SOC). Sociodemographic characteristics and dental caries variables with $p \leq 0.20$ in the unadjusted analysis were included in the adjusted model as possible confounders. The multilevel structure of analysis considered individuals (level 1) nested into 15 neighbourhoods (level 2). Multilevel analysis considered the individual sampling weights when adjusting for survey design. The individual sampling weights consider the inverse of the probability of selecting the adolescent, once the adolescent's neighbourhood has already been selected. All the analysis were conducted using the *svy* command for fitting multilevel models to survey data in Stata. The results are presented in Rate Ratio (RR) and 95% confidence intervals (95% CI).

The simple slope test was conducted afterwards once the hypothesized moderation effects were statistically significant to obtain the simple margins of predicted values by each level of the categorical moderator. This procedure allows the calculation of the conditional effect of social capital on OHRQoL according to SOC levels (moderator), generating a confidence interval and p-values [27]. A significance level of 0.05 was considered.

Results

Of the 639 subjects assessed at baseline, 429 were reassessed at 10-years follow-up (cohort retention rate = 67.1%). The reasons for losses to follow-up were impossibility of finding the adolescent (n = 184); move to another city (n = 19); or refusal to participate (n = 7). There were no significant differences of characteristics between individuals who completed the 10-years follow up and dropouts, nor between those evaluated before and during the COVID-19 pandemic ($p>0.05$).

Table 1 reports the descriptive characteristics of the sample. The sample was balanced between boys and girls, and most individuals reported white skin colour in both assessments. The mean age was 2.8 (SE 0.1) and 12.5 (SE 0.1) years old at baseline and follow-up. Most individuals presented monthly family income higher than 1 BMW (70.8%) and mothers with more than 8 years of schooling at T1. The majority of participants presented high levels of

social capital at T1 and T2, and about 7.9% of the sample presented low SOC at T2. The mean of CPQ11-14 total scores at follow-up was 11.2 (SE = 0.6).

Table 2 shows the multilevel unadjusted analysis considering the interaction of social capital at T1 and T2 and SOC at T2 on CPQ11-14 total scores at follow-up. In the crude analysis, individuals with low social capital at T2 (1.16; 95% CI 1.01-1.32) had greater likelihood of poor OHRQoL. Individuals with high SOC were more likely to report better OHRQoL (RR 0.39; 95% CI 0.36-0.46). The majority of categories of the interaction term social capital x SOC were associated with OHRQoL considering low social capital and low SOC as the reference category.

The results of the moderation analysis after adjustment for confounders are presented in Table 3. In general, moderate and high levels of SOC demonstrated a moderating effect on the relationship between social capital and OHRQoL. Among individuals who presented low social capital at T1 and T2, those who had higher SOC reported, respectively, an impact 63% and 70% lower on OHRQoL than those with low SOC. Considering those with high social capital at T1 and T2, those who had higher SOC reported an impact 55% and 71% lower on OHRQoL than those with low SOC. Regardless of the SOC level, the relationship between SOC and OHRQoL was also lower among individuals with high social capital.

Figures 2 and 3 presents the predictive marginal effects between social capital at T1 and T2 and CPQ11-14 total scores according to different levels of SOC. According to the figures, the differences in predictive margins are visible only considering high levels of social capital at follow-up (cross-sectional interaction). However, the simple slope test (Table 4) indicated that the negative effects of low social capital on OHRQoL were statistically significant across different levels of SOC levels (low, moderate, and high) in both assessments (T1 and T2). The greatest margin effect was observed in individuals with low social capital and low SOC at T2 (24.25; $p<0.05$).

Discussion

This study aimed to evaluate the moderating effect of SOC on the association between social capital and OHRQoL. Our findings confirm the conceptual hypothesis that high SOC could attenuate the impact of low social capital on poor OHRQoL. In addition, the greatest moderation effect of SOC was observed in the interaction with social capital at follow-up. Despite the relationship between the characteristics of social life, SOC and OHRQoL in children and adolescents has already been researched [5,11,15], such association considering the moderating effect of SOC has not been explored yet.

Considering the predictor variables separately, individuals with low social capital at baseline and at follow-up presented poorer OHRQoL at follow-up. This finding corroborates previous cross-sectional and cohort studies [5,15,28]. In our study, social capital was measured through proxies such as social networks and perception of trust. Thus, the present findings can be explained since individuals with more social networks and trust are subject to peer and more likely to adopt healthy behaviours [10,29] that may influence OHRQoL. Moreover, these individuals are more likely to use dental services [10,29], which in turn can be related to better OHRQoL. Greater social capital can also benefit health acting as a protective factor buffering the effects of stress through feelings of security, belonging, and social support, and consequently impacting on self-perceived health and quality of life [10,29]. Thus, individuals with low levels of social capital tend to report more oral impacts on their quality of life.

Among individuals with low social capital, those with moderate and high levels of SOC showed lower odds of worse OHRQoL than those with low SOC. Previous studies have shown a moderating effect of SOC on general and OHRQoL, considering other predictors, such as the need for dental prostheses and dental caries [14,21]. Furthermore, it has been suggested that SOC interacts with a person's natural coping style and social support [11,12]. Subjects with high SOC assess situations in a more comprehensive way, see life events and health-disease problems as challenges worthy of effort, perceive available resources more easily, and use them to cope with stress when necessary [6]. Previous studies have reported that high SOC was associated with better normative and subjective oral health outcomes [13,14,30]. Thus, despite having low social capital, more resilient individuals tend to feel less affected by oral problems, and consequently, present a better OHRQoL.

Our findings also indicated that the negative effects of low social capital on OHRQoL were statistically significant across different levels of SOC in both assessments (baseline and follow-up). However, the greatest moderation effect of SOC was observed in the interaction with social capital at follow-up (cross-sectional interaction). Possible explanations for this finding include the assessment of social capital by parents at baseline and by the adolescents at follow-up. In addition, social capital may have changed over time. Parent’s social capital may be different from the adolescent's social capital, since social capital may vary according to time, gender, and personal experiences [31]. In addition, since SOC interacts with a person's natural coping style and social capital, the extent to which these elements are available is one of the main determinants related to the development of SOC [11]. In this sense, the protective effect provided by the interaction between the social capital reported by adolescents and their SOC

on OHRQoL may be more strongly linked in the same stage of life, which is in agreement with our results.

Our findings must be interpreted with caution due to some limitations. First, we assessed social capital through indicators or proxies, which may not give a complete measure of the construct. However, these indicators have been commonly used in previous studies [5,22]. In addition, possible changes of SOC over the study period was not assessed since the construct was only investigated at follow-up. Finally, follow-up data collection was affected by the COVID-19 pandemic, which may have led to information bias among individuals who were assessed before and during this period. However, sensitivity analysis demonstrated that this issue did not affect our findings. Moreover, postponing data collection for a post-pandemic period would possibly result in the modification of the predictors considered in this study that affect the OHRQoL. In addition, the observational nature of our study design imposes restrictions whether the observed differences are clinically relevant. Nevertheless, our findings showed that all differences in the predictive margins between social capital and overall OHRQoL scores according to different levels of SOC were greater than the minimally important difference (MID) reported in previous clinical studies that used CPQ11-14 [32,33].

Our study also has strengths. This 10-year cohort study had a high retention rate (67.1%) and was conducted during an important period of life characterized by biopsychosocial development. Studying psychosocial factors from childhood to adolescence is extremely important, as experiences during this stage can be perpetuated throughout life [34, 35]. In addition, our study considered important psychosocial conditions, which have been explored in the previous literature [12-15, 36, 37]. In this context and based on our findings, further research is needed to evaluate interventions aiming to promote SOC and social capital, and their impact on the subjective health and oral health promotion in different population groups. Furthermore, future research aiming to examine the possible role of other modifying factors of oral health conditions, as well as high-quality trials, especially assessing the sustainability of the intervention effect, is necessary.

Conclusion

Our findings showed that SOC may have a moderating effect on the relationship between social capital and OHRQoL. Schoolchildren with low social capital and high SOC were protected from having worse OHRQoL compared to individuals with low SOC. This finding is useful to encourage public health policies aiming to stimulate and increase SOC among individuals,

especially from childhood to adolescence, once it can mitigate the harmful effects of low social capital on OHRQoL.

List of abbreviations

CPQ: Child Perception Questionnaire; OHRQoL: Oral Health-related Quality of Life; BMW, Brazilian minimum wage; WHO: World Health Organization; DMFT: decayed, missing and filling teeth; SD: standard deviation; SE: standard error; SOC: sense of coherence; RR: Rate Ratio; CI, confidence interval.

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Authors' contributions

Ms Knorst conceptualized and designed the study, collected data, performed the statistical analyzes, drafted the initial manuscript, and revised the manuscript. Ms Brondani collected data and revised the manuscript. Dr Emmanuelli, Dr Tomazoni and Dr Vettore designed the study and revised the manuscript. Dr Ardenghi designed the study, coordinated and supervised the data collection and critically reviewed the manuscript. All authors have approved the final manuscript and agree to be accountable for all aspects of the paper.

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Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Human Research Ethics Committee of the Federal University of Santa Maria (protocol number 11765419.1.0000.5346), Brazil. Informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest in relation to the products or methods mentioned herein.

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Figure Legends

Figure 1. The logic map of the moderation effects.

Figure 2. Predictive marginal effects between social capital at baseline and overall CPQ11-14 scores according to different levels of sense of coherence.

Figure 3. Predictive marginal effects between social capital at follow-up and overall CPQ11-14 scores according to different levels of sense of coherence.

Table 1. Demographic, socioeconomic, psychosocial, and oral health variables of the sample at baseline and follow-up

Variables	Baseline (T1) 2010 (n=639)	Follow-up (T2) 2020 (n=429)	p-value
Demographic and socioeconomic variables			
Sex [n (%)]			0.227
Boys	322 (49.0)	209 (49.8)	
Girls	317 (51.0)	220 (50.2)	
Age [mean SE)]	2.8 (0.1)	12.5 (0.1)	0.101
Skin color			0.158
White	501 (80.5)	215 (48.5)	
No-white	137 (19.5)	211 (51.5)	
Household income in BMW [n (%)]			0.109
≤ 1BMW	129 (19.0)	110 (29.2)	
> 1BMW	473 (81.0)	264 (70.8)	
Maternal education [n (%)]			0.669
≥ 8 years	357 (54.3)	285 (69.6)	
< 8 years	275 (45.7)	110 (30.4)	
Psychosocial variables			
Social capital [n (%)]			0.472
High	479 (75.6)	315 (73.5)	
Low	154 (24.4)	110 (26.5)	
Sense of coherence [n (%)]			-
Low	-	35 (7.9)	
Middle		145 (32.6)	
High		249 (59.5)	
Oral health variables			
Untreated dental caries [n (%)]			0.773
Absent	408 (61.6)	300 (69.4)	
Present	231 (38.4)	128 (30.6)	
CPQ11-14 [mean (SE)]	-	11.2 (0.6)	-

*Taking into account the sampling weight; Values lower than 639 or 429 are due to missing data. †Comparison between followed and dropouts' individuals; BMW, Brazilian minimum wage; SE, standard deviation; CPQ, child perception questionnaire.

Table 2. Unadjusted association of social capital at T1 and T2 and sense of coherence with overall CPQ11-14 scores at follow-up.

Variables	OHRQoL (CPQ11-14)	
	RR (95% CI)*	**p-value**
Social capital (T1)		
High	1 (reference)	
Low	1.12 (0.79-1.58)	0.507
Social capital (T2)		
High	1 (reference)	
Low	1.16 (1.01-1.32)	<0.001
Sense of coherence (T2)		
Low	1 (reference)	
Middle	0.73 (0.64-0.83)	<0.001
High	0.40 (0.35-0.45)	<0.001
Interaction variables		
Social Capital (T1) x Sense of coherence (T2)		
Low x Low	1 (reference)	
High x Low	0.99 (0.78-1.27)	0.993
High x Middle	0.71 (0.55-0.91)	<0.001
High x High	0.40 (0.33-0.51)	<0.001
Low x Middle	0.81 (0.55-1.17)	0.274
Low x High	0.37 (0.29-0.47)	<0.001
Social Capital (T2) x Sense of coherence (T2)		
Low x Low	1 (reference)	
High x Low	0.69 (0.42-1.13)	0.146
High x Middle	0.57 (0.35-0.91)	<0.005
High x High	0.31 (0.22-0.43)	<0.001
Low x Middle	0.58 (0.44-0.76)	<0.001
Low x High	0.32 (0.20-0.51)	<0.001

*Taking into account the sampling weight; OHRQoL, oral health-related quality of life; RR, rate ratio; CI, confidence interval; T1, baseline; T2, 10-years follow-up;

Table 3. Adjusted analysis of the interaction of social capital at T1 and T2 and sense of coherence on overall CPQ11-14 scores at follow-up

Interaction variables	**OHRQoL (CPQ11-14)**	
	RR (95% CI)*	**p-value**
Social Capital (T1) x Sense of coherence (T2)		
Low x Low	1 (reference)	
High x Low	1.11 (0.84-1.48)	0.447
High x Middle	0.81 (0.62-1.07)	0.154
High x High	0.45 (0.35-0.57)	<0.001
Low x Middle	0.87 (0.61-1.26)	0.486
Low x High	0.37 (0.30-0.44)	<0.001
Social Capital (T2) x Sense of coherence (T2)		
Low x Low	1 (reference)	
High x Low	0.64 (0.43-0.93)	<0.005
High x Middle	0.55 (0.39-0.77)	<0.001
High x High	0.29 (0.23-0.35)	<0.001
Low x Middle	0.58 (0.48-0.69)	<0.001
Low x High	0.30 (0.20-0.44)	<0.001

*Taking into account the sampling weight and adjusted by sex, skin color, age, household income, and untreated dental caries; OHRQoL, oral health-related quality of life; RR, rate ratio; CI, confidence interval; T1, baseline; T2, 10-years follow-up;

Table 4. Predictive marginal effects between the social capital and OHRQoL according to different levels of sense of coherence among individuals with low social capital

	OHRQoL	
Interaction variables	**Margin (95% CI)**	**p-value**
Low social capital at T1		
Low SOC	19.41 (16.92-21.90)	<0.001
Middle SOC	14.89 (13.64-16.13)	<0.001
High SOC	7.76 (6.99-8.52)	<0.001
Low social capital at T2		
Low SOC	24.25 (20.8-27.6)	<0.001
Middle SOC	13.61 (12.5-14.8)	<0.001
High SOC	7.93 (7.21-8.65)	<0.001

SOC, sense of coherence; CI, confidence interval; T1, baseline; T2, 10-years follow-up.

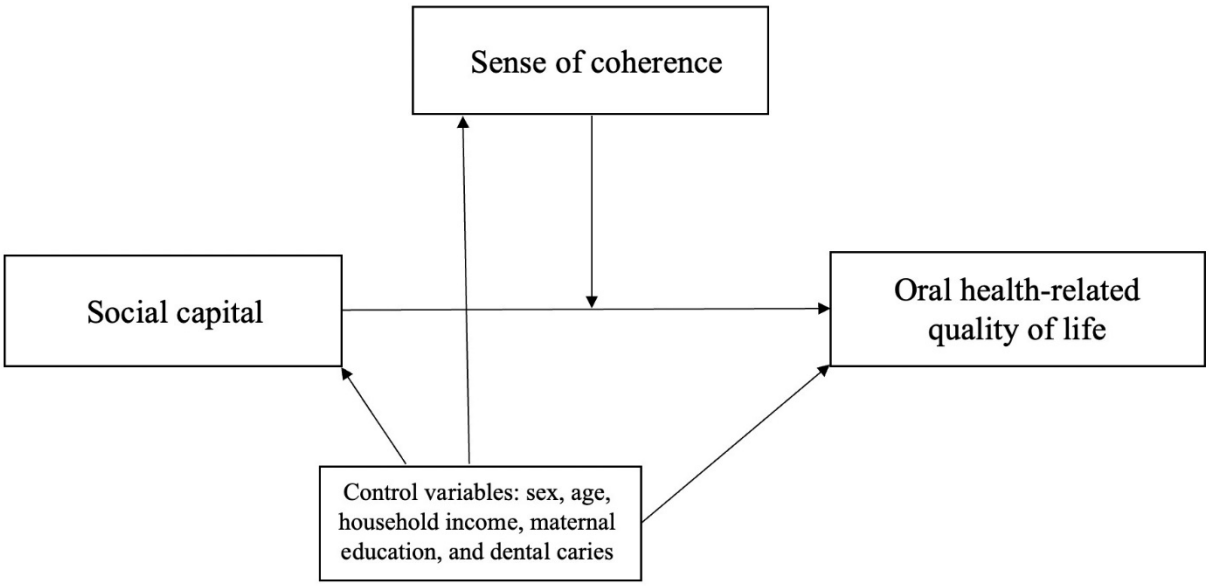

Figure 1. The logic map of the moderation effects.

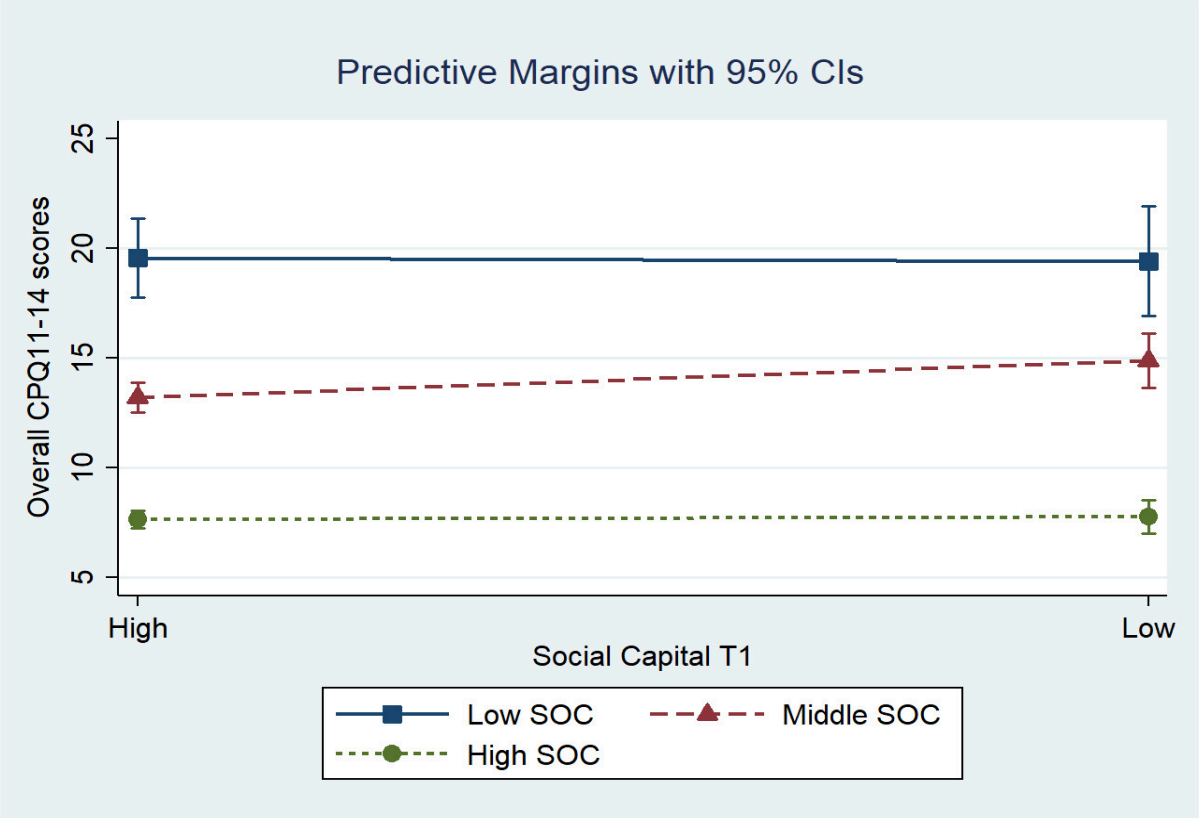

Figure 2. Predictive marginal effects between social capital at baseline and overall CPQ11-14 scores according to different levels of sense of coherence.

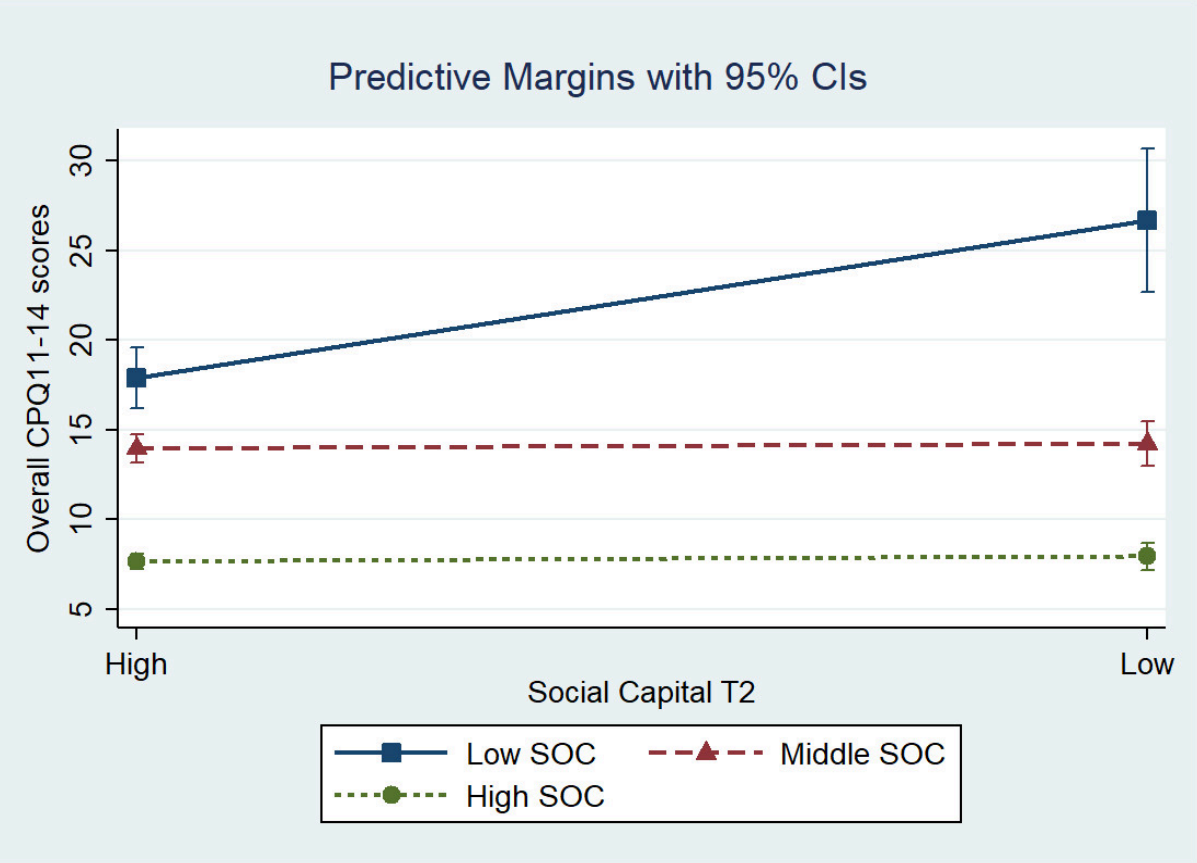

Figure 3. Predictive marginal effects between social capital at follow-up and overall CPQ11-14 scores according to different levels of sense of coherence.

6 ARTIGO 4 – IMPACT OF COMMUNITY AND INDIVIDUAL SOCIAL CAPITAL DURING EARLY CHILDHOOD ON ORAL HEALTH-RELATED QUALITY OF LIFE: A 10-YEAR PROSPECTIVE COHORT STUDY

Este artigo foi submetido ao periódico *Journal of Dentistry*, ISSN: 0300-5712, Fator de impacto 4,991 e Qualis A1. As normas para publicação estão descritas no Anexo I.

Impact of community and individual social capital during early childhood on oral health-related quality of life: a 10-year prospective cohort study

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Short title: social capital and quality of life in childhood and adolescence

CRediT authorship contribution statement

Jessica K. Knorst: conceptualized and designed the study, collected data, performed the statistical analyzes, drafted the initial manuscript, and revised the manuscript; **Mario V. Vettore**: designed the study and critically revised the manuscript. **Bruna Brondani**: conceptualized and designed the study, collected data and revised the manuscript. **Bruno Emmanuelli:** designed the study and critically revised the manuscript. **Saul M. Paiva:** designed the study and critically revised the manuscript. **Thiago M Ardenghi:** designed the study, coordinated and supervised the data collection and critically reviewed the manuscript.

Declaration of Competing Interest

The authors have no conflicts of interest in relation to the products or methods mentioned herein.

Impact of community and individual social capital during early childhood on oral health-related quality of life: a 10-year prospective cohort study

Abstract

Aim: To evaluate the impact of community and individual social capital during early childhood on oral health-related quality of life (OHRQoL) over a 10-year follow-up period.

Methods: A prospective cohort study was conducted in the southern Brazil. Baseline (T1) data collection occurred in 2010 with preschool children aged 1-5 years. Participants were assessed in 2012 (T2), 2017 (T3), and 2020 (T4). OHRQoL was assessed using the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS) at T1 and T2 and through Child Perceptions Questionnaire (CPQ8-10 and CPQ11-14) at T3 and T4. Community social capital was evaluated at T1 through the presence of formal institutions in the neighbourhood and individual social capital by social networks. Demographic and socioeconomic characteristics were also evaluated. Multilevel Poisson regression analysis was performed to estimate the impact of social capital measures on OHRQoL over time.

Results: Of the 639 children assessed at T1, 469 at T2 (73.3% response rate), 449 at T3 (70.3% response rate), and 429 at T4 (67.1% response rate). Individuals living in neighbourhoods with the presence of social class associations at T1 had higher OHRQoL at T3 and T4. Individuals whose families visit friends and neighbours less than once a month or never at T1 had lower OHRQoL along with the follow-ups. Attending religious meetings less than once a month or never at T1 was associated with lower OHRQoL at T2 and T4.

Conclusion: Individual social capital levels in early childhood impacted on OHRQoL across the assessments, while social capital at the community level had a long-term effect, impacting especially during adolescence.

Clinical Significance: Our findings indicate that psychosocial variables can impact subjective patient outcomes, which are considered a fundamental aspect of clinical practice.

Key-words: Child. Longitudinal study. Quality of life. Oral health. Social capital.

Introduction

Social capital came into evidence in scientific research, mainly by Pierre Bordieu (1986), James Coleman (1988), and Robert Putnam (1993). However, the definition and measurement of social capital remains in debate [1-3]. In general, social capital has been described as social resources contained on accessible social networks or social structures characterized by mutual trust, which can evolve and facilitate access to various returns, benefiting the individual and the community [4]. The concept of social capital is based on the positive consequences of sociability and places these consequences in the broader discussion of capital. Despite the controversies regarding its definition and numerous criticisms [5], a growing body of evidence suggests that high levels of social capital benefit health [6].

High levels of social capital have been linked to lower mortality rates, better self-rated general health, and better mental health [7,8]. Social capital has also been related to clinical oral health outcomes, such as less occurrence of dental caries and gingivitis [9,10]. The literature has also shown that social capital assessed through social networks and community social support was associated with subjective oral health [11]. Previous studies have shown that the social network in which the individual is embedded was associated to self-perceived oral health since healthy behaviours were associated with more social networks [12]. Furthermore, it has been shown that the presence of formal institutions in the community was related to greater involvement of individuals in social activities, which increases social cohesion and trust in the neighbourhood, as well as oral health and quality of life of the residents [12,13].

It has been shown that the amount and quality of different sources of social networks can influence patient-reported outcomes [6], such as oral health-related quality of life (OHRQoL), which is an essential component in the current concept of oral health [14]. Although recent evidence suggests the link between social networks and social support and oral health outcomes [11,13,15,16], most of these studies are of cross-sectional study design. There is a dearth of studies evaluating these associations over time as well as the role of social conditions throughout life on oral health [17], especially during the transition from childhood to adolescence, a period characterized by numerous biological and psychosocial changes. Thus, longitudinal studies are needed to verify the impact of different social factors on oral conditions during this period of transition, since they are usually cumulative and may negatively influence general and oral health in adulthood [17].

Understanding the longitudinal associations of community and individual social capital with OHRQoL throughout childhood to adolescence, as well as identifying in which period these factors exert the highest impact on OHRQoL, can provide useful information on the

importance of community and social relationships. Thus, this study aimed to assess the impact of community and individual levels of social capital in early childhood on the OHRQoL over 10 years of follow-up. We hypothesized that high levels of community and individual social capital may positively impact OHRQoL over time.

Materials and Methods

Study design and population

This is a 10-year prospective cohort study involving preschool children from Santa Maria, a southern city in Brazil. The baseline (T1) was an oral health survey, carried out in 2010. The participants were assessed in 2012 (T2), 2017 (T3), and 2020 (T4) (Figure S1). Further information about the population, sampling process and methodological aspects of the cohort study is described elsewhere [15,18,19].

Sample size calculation used a standard error of 5%, a statistical power of 80%, and a prevalence ratio of 1.45 of impact on OHRQoL in children of the exposed group (high social vulnerability) and unexposed group (low social vulnerability) [20], and a ratio of unexposed to exposed of 2:1, totalling a sample size of 264 children. To improve precision, a correction factor for the effect design of 1.2 was applied, as the multi-stage sampling method was used instead of simple random sampling. The minimum sample size was determined in 330 children, to which 30% was added to compensate for possible losses, resulting in a sample of 472 pre-schoolers aged one to five years. In addition, the sample size was also measured by a post hoc power calculation considering the difference in overall OHRQoL scores in each time for the non-exposed group (high social capital) and exposed group (low social capital) according to all social capital variables. The study power ranged from 80 to 100% considering an alpha error probability of 0.05 and a 95% confidence interval.

Baseline evaluation (T1)

The baseline of the study (T1) included children aged from 1 to 5 years in the city of Santa Maria in 2010. During this period, the estimated population of the city was 263,403 inhabitants, which included 27,520 children under the age of 6 years. A systematic probabilistic sample was selected from all children who attend healthcare centres in the city on the National Children's Vaccination Day. The primary sampling units included 15 healthcare centres that had a dental office, located in different neighbourhoods of the city. These healthcare centres encompassed about 90% of the children vaccinated in the municipally. Every fifth child in line for vaccination

was invited to participate in the study. If their caregivers did not authorize their participation, the next child in line was invited. A total of 639 children aged 1 to 5 years was examined.

Follow-up evaluations (T2, T3 e T4)

The second evaluation (T2) occurred in 2012, approximately two years after the baseline data collection. All children assessed at T1 were invited to participate. The participants were evaluated from May 2012 to February 2013 when they were aged between 3 and 7 years [20].

The third stage of assessments (T3) was conducted at seven years of follow-up from January 2017 to March 2018 [15]. The sampling plan was also based on all children assessed at T1 who were aged between 8 and 12 years at T3.

All children who participated in the initial survey (T1) were invited to participate in the fourth assessment (T4), corresponding to 10 years follow up when the participant's age ranged from 11 to 15 years old. The T4 data collection period started in November 2019, which was interrupted in March 2020 due to the COVID-19 pandemic [21]. The completion of T4 data collection was between October 2020 and January 2021 with all appropriate procedures.

The participants were assessed in their homes or in their respective schools. The following strategies were adopted to contact the participants across all waves of the study in order to minimize losses to follow-up. Firstly, the list of all students enrolled in public schools in the city of Santa Maria was obtained from the city's Enrolment Centre. Secondly, children's parents were contacted through telephone calls to schedule home visits. Thirdly, participants and their caregivers who were not reached using the first two approaches were contacted through social networks, such as WhatsApp or Facebook.

Data collection and variables

Data were collected through interviews using structured questionnaires [22], and oral clinical examinations in all assessments of this cohort. All data collection procedures were founded in international criteria standardized for oral health surveys [23-30].

Oral health-related quality of life

Due to the long follow-up period, children's OHRQoL was evaluated using an appropriate instrument according to their age. Children's OHRQoL was assessed at T1 and T2 using the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS), completed by their parents or guardians, since children aged from 1 to 5 years do not have adequate cognitive skills to understand and respond the questions [24]. ECOHIS consists of 13 items grouped into

2 sections: 9 items corresponding to the child impact section (symptoms, function, psychology, self-image, and social interaction domains) and 4 items related to the family impact section (parental anxiety and family function). The responses were obtained using a six-point Likert scale with scoring options ranging from 0 to 5 points: (0) never; (1) hardly ever; (2) occasionally; (3) often; (4) very often; and (5) don't know. The responses coded “don't know” were considered missing data. For those with up to two missing responses in the child section or one missing answer in the family section, the average of the scores of each section was used to input the score of the missing item [24]. Participants with missing responses in more than two child items and one family item were excluded. The sum of overall ECOHIS scores can range from 0 to 52. Higher scores indicate worse OHRQoL.

OHRQoL was measured at T3 and T4 using the Child Perceptions Questionnaire (CPQ8-10) [25] and the short version of the Child Perceptions Questionnaire 11-14 (CPQ11-14 ISF:16) [26], respectively. The questionnaires are composed of 25 and 16 questions, grouped into 4 domains: oral symptoms, functional limitation, emotional well-being, and social well-being. The questions were answered using a grading scale with scores options ranging from 0 to 4 points: (0) never; (1) once or twice; (2) sometimes; (3) often; and (4) every day/almost every day. The final score is obtained by summing the scores of all items. The total scores of CPQ8-10 and CPQ11-14 can range from 0 to 100 and 0 to 64 points, respectively. The higher the score, the higher the impact of the oral health condition on quality of life.

Social capital

Individual and community social capital characteristics were assessed at T1. Community-level social capital was measured according to the presence of community cultural centres, workers associations, and social class associations in the neighbourhood. These indicators have previously been used as proxy measures of community social support and social network and are theoretically related to social capital and social cohesion constructs [4,11,12]. Community-level variables were obtained from the local council according to the geographic areas of the neighbourhoods where the children live at T1, totalling 15 neighbourhoods. All the 15 included neighbourhoods belonged to the same municipality.

Individual social capital was assessed according to the social networks through the following questions: “How often do you attend group religious activities?” and “In the last 12 months, how often have you visited or received visits from friends and neighbours?” with the following response options: (0) at least once a month; and (1) less than once a month or never.

In addition, information about the parent's participation in the child's school activities was also obtained. These questions are commonly used in the literature on social capital [15,27].

Covariates

Data regarding sex, skin colour, and socioeconomic status were evaluated at T1, T2, T3 and T4 as possible confounding factors. Participant's skin colour was assessed according to the criteria proposed by the Brazilian Institute of Geography and Statistics (IBGE) used in population-based surveys in Brazil [28], using the following question: "What is your child skin colour?" (0) white; (1) brown; (2) black; (3) yellow or (4) indigenous? For data analysis, individuals were classified as "white" (0) and "non-white" (1, 2, 3, and 4). Monthly family income and maternal education were used to assess socioeconomic status. Monthly family income was registered according to the income of the family members in the last month in Brazilian Reais. One US$1.00 corresponded to R$5.4 when the data was collected. Family income was a continuous variable. Maternal education was assessed according to the number of years of formal education completed with approval and categorized as < 8 or ≥ 8 years of education.

Dental caries was measured in all waves using the diagnostic criteria of the International Caries Detection and Assessment System (ICDAS) [29], in which all dental surfaces were evaluated. The examiners were previously trained and calibrated, with inter-and intra-examiner Kappa coefficients ranged from 0.70 to 0.96 in all evaluations. Participants were individually examined with the aid of gauze, CPI probe ("ballpoint"), and dental mirror [23]. Schoolchildren were examined in dental chairs in the health centres using artificial lighting (reflector) at T1. In the follow-up assessments (T2, T3, and T4), they were examined in their homes or schools using natural light. For data analysis, the presence (scores 3, 5, and 6) or absence (scores 0, 2, and 4) of untreated dental caries was considered.

Ethical aspects

This project was approved by the Research Ethics Committee (CEP) of the Federal University of Santa Maria (protocol CAAE 11765419.1.0000.5346) and is in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. All parents signed a written informed consent agreeing with their children's participation before data collection.

Data analysis

Data analyses were conducted considering the sample weight ('svy' command) for complex data samples on STATA 14 (Stata Corporation, College Station, TX, USA). Demographics, socioeconomic characteristics, psychosocial factors, and clinical characteristics at T1, T2, T3, and T4 were described through proportions, means and standard errors. The comparison between individuals followed and lost at follow-up and among those assessed before and during the COVID-19 pandemic was evaluated using the Chi-square test and the *t*-test. Individuals were compared for demographic, socioeconomic, clinical, and social capital variables. Descriptive analysis of OHRQoL according to social capital variables at baseline and follow-up intervals was also performed using means and standard errors.

The study outcome was the standardized overall OHRQoL scores over time. The final scores of OHRQoL questionnaires were standardized from 0- to 100-point scale for analytical purposes, as described elsewhere [30]. Multilevel Poisson regression analysis was performed to estimate the impact of different community and individual social capital variables at T1 on OHRQoL in each follow-up period. Demographics, socioeconomic and clinical variables were included in the adjusted model as possible confounders (variables with $p \leq 0.20$ in the unadjusted analysis were considered in the adjusted model). The multilevel structure of analysis considered individuals (level 1) nested into 15 neighbourhoods (level 2), using the fixed effect with random intercept method. The results are presented as Incidence Rate Ratio (IRR) and 95% confidence intervals (95% CI).

Results

Of the 639 children assessed at baseline, 469 (73.3% response rate), 449 (70.3% response rate), and 429 (67.1% response rate) were assessed at T2, T3, and T4, respectively. The reasons for the losses at follow-up were mainly due to not locate of the individuals (Figure S1). There was no difference among participants and dropouts regarding most of the sample characteristics ($p<0.05$). However, individuals followed in T3 were significantly poorer than dropouts' ones. Bootstrap sensitivity analysis was performed and showed that these differences did not affect the results. No significant missing values were observed for the main variables considered in the study. In addition, there was no difference among the individuals assessed before and during the COVID-19 pandemic at T4 data survey.

Table 1 presents the sample characteristics at baseline for individuals followed throughout 10 years. The sample was evenly distributed between girls and boys and most of the participants had white skin colour. Mean income at T1 was 1,204 Reais (standard error [SE] 42.1), approximately U$223. Most of the neighbourhoods did not present formal institutions at

baseline. Regarding individual social capital, most families (56%) attended religious meetings and visited friends and neighbours at least once a month at T1. Most parents did not attend their children's school activities (60.9%). Overall OHRQoL scores increased throughout the cohort assessments.

The distribution of the OHRQoL scores according to social capital variables is shown in Figure 1 and in Table S1. At baseline, OHRQoL scores were similar according to the presence or absence of formal institutions in the neighbourhood. However, along the follow-up, in general, the OHRQoL scores worsened for those individuals who lived in neighbourhoods with low social capital. OHRQoL was lower among those with low individual social capital, including low social networks, especially in relation to the frequency of visits to friends and neighbours, being higher for individuals whose family members did not visit friends and neighbours frequently.

Unadjusted analysis of the social capital predictors at baseline on OHRQoL over time are presented in Table S2. Social class associations at baseline were related to OHRQoL at T3 and T4 ($p<0.05$). Attending group religious meetings was associated with OHRQoL scores at T2 and T4 and visit to friends/neighbours at T1, T3 and T4 ($p<0.05$). Parents' school involvement also impacted children's OHRQoL at T1, T2 and T3 ($p<0.05$).

Table 2 shows the adjusted analysis of the association between social capital variables and OHRQoL at baseline and at T2, T3 and T4. Individuals who lived in neighbourhoods with social class associations at T1 had a lower impact on OHRQoL at T3 (IRR 0.79; 95%CI 0.66-0.96) and at T4 (IRR 0.77; 95%CI 0.67-0.89), respectively. Attending religious meetings less than once a month or never at T1 was associated with a higher impact on OHRQoL at T2 and T4. Individuals whose families visit friends and neighbours less than once a month or never at T1 had 14%, 16%, and 27% higher impact on OHRQoL at T1, T3, and T4, respectively. Considering the school involvement, individuals whose parents were not involved at T1 presented overall OHRQoL scores 25% higher than their counterparts with school-active parents at T3 (IRR 1.25; 95%CI 1.17-1.33).

Discussion

This study evaluated the impact of community and individual social capital in childhood on OHRQoL over time. Our findings confirm the conceptual hypothesis, demonstrating that over the assessments OHRQoL was higher for those individuals who presented high social capital. However, while individual social capital levels in early childhood affected OHRQoL over the assessments, social capital in the community level impacted especially during adolescence.

Although previous studies have evaluated the association between social capital and OHRQoL [11,13,15,16], there is a dearth of investigations looking into this relationship across different age periods using a cohort study design.

Our results showed that individuals presenting high community and individual social capital at baseline presented higher OHRQoL over periods of evaluation for most of the social capital variables considered (social class associations, attending group religious meetings, visit to friends/neighbours, school involvement). This result is in agreement with previous studies in children and adolescents, showing that the impact of oral health on quality of life was lower among individuals with high levels of social capital [11,13,15,16]. Thus, living in a neighbourhood with greater social support and social cohesion, or having some kind of social networks, has been strongly linked to better oral health behaviours, greater access to services, and less psychosocial stress [4,6], which may be related to lower impacts on OHRQoL.

Individuals who lived in neighbourhoods that presented social class associations at baseline presented higher OHRQoL after 7 and 10 years of follow up, showing that high community social capital in early childhood positively impacted on OHRQoL during the adolescence. This variable was used as a proxy for community social support since they are theoretically related to social capital and social cohesion at community level [4,11,12]. Previous studies have longitudinally reported an association between low levels of community social capital and worse oral health outcomes, such as tooth loss [31], dental caries [32] and low OHRQoL [15]. One explanation for this finding is that neighbourhoods that present high levels of social capital are places where healthy behaviours and positive social norms are more easily disseminated and have better health services, which may impact oral health [6]. In addition, people living in areas with high social capital tend to experience less psychosocial stress and are more resilient, which has a positive effect on perceived health, such as OHRQoL [6].

The fact that neighbourhood-level social capital had a long-term impact on OHRQoL can be explained by the risk accumulation model of life course epidemiology [33,34]. Neighbourhood-level characteristics tend to be more structured and stable in the short term, as they are dependent on public policies and organizational aspects of the community or municipality [33,35]. The accumulation of contextual conditions where the individuals were exposed in early childhood tends to perpetuate over time, which may explain the impact of contextual social capital on OHRQoL over 7 and 10 years. Furthermore, only social class associations in the neighbourhood were associated with OHRQoL at community level, while cultural community centres and workers' associations were not. A social class association can be defined as a union of people with common interests who come together to gain strength to

achieve some objective, and can be linked to economic, professional, religious interests or social causes in the community [3]. Thus, since this entity can refer to different aspects of a community, we believe that it could weigh more on health outcomes. However, it is noteworthy that different variables at the community level can impact general and oral health and should be investigated.

Individual social capital variables in early childhood were associated with OHRQoL throughout all assessments. Attending religious meetings less than once a month or never at T1 was also associated with lower OHRQoL after two and 10 years. Previous studies have shown that attending religious meetings acts as a source of social capital through the expansion of social networks, as well as through feelings of trust and belonging, which can positively impact oral health outcomes [36,37]. In addition, our results demonstrated that visiting friends and neighbours infrequently are related to low OHRQoL at T1, T3, and T4, in agreement with previous cross-sectional studies [13,38]. It has been shown that frequent contact with friends or neighbours may reduce social isolation, which plays an important role in maintaining oral health through social support [1,6]. Furthermore, individual's social networks may exert social control and influence their peers which can also impact health behaviours and oral conditions [1,2,6]. Parents' school involvement was associated with participant's OHRQoL. It has been acknowledged that parental school involvement refers to social connection consisting of vertical bonds between people from different formal hierarchies [4], which is considered an important source of social ties, impacting the well-being and health of children, as well as their subjective perceptions [15,39].

Despite individual social capital variables impacted on OHRQoL throughout all assessments, this relationship did not follow a pattern. Some social capital variables impacted at baseline, others at 2 years follow up or 7 years follow up, and others after 10 years of follow-up. These inconsistencies may be due to the fact that individual level social capital may change over time, as it may vary according to age, gender, and personal experiences [40]. In addition, baseline social capital was assessed through the parents, which may not reflect the adolescent's social capital over time. Notwithstanding, it is worth mentioning that the individual variable that impacted on OHRQoL for the longest time and in more evaluations was the frequency of visits to friends and neighbours. This can be explained because this type of tie is normally the most common, accessible, strong, and long-lasting that can occur between individuals, resulting in strong mutual trust [1,2,4]. In this sense, as previously described, this variable can be considered a proxy measure of individual social networks and can have a very positive impact on oral health and OHRQoL, as demonstrated in our findings.

There are some limitations in our study. Firstly, we used different instruments to measure OHRQoL over the cohort assessments. However, valid and cross-culturally adapted instruments were used according to each age group, and the scores were later standardized according to previous literature [30]. Secondly, OHRQoL measures were assessed in each period and multilevel analysis for repeated measures were not conducted. However, the purpose of this study was to assess OHRQoL outcomes in each time period according to the baseline social capital variables. Thirdly, social capital was assessed through proxy measures, which may result in incompleteness assessment of this construct. However, different social capital measures were used in this study allowing the examination of distinct indicators that can affect OHRQoL. Finally, social capital variables were measured at baseline only, and possible variations of social capital over time were not assessed. In addition, our objective was to verify whether social capital in early childhood would impact OHRQoL over each follow-up period of this 10-year cohort.

This study also has some strengths that deserve to be highlighted. This is a cohort study with a 10-year follow-up that encompassed a high response rate of at least 67.1% across 10-years of follow-ups. Thus, our study managed to maintain the minimum sample required throughout all follow-up evaluations, which is extremely important and difficult to achieve in a 10-year longitudinal study [41], strengthening the validity of our findings. In addition, this study covered an important transition period in the lives of individuals, which is subject to changes and impacts that can last throughout life [17]. Thus, acting on social capital in this period can be very favourable to promote oral health in adult life. Finally, we consider different levels and types of social capital, which may impact OHRQoL indicators on this population, encouraging future interventions and public health policies.

Conclusions

Overall, our findings showed that individuals who had high social capital in early childhood presented higher OHRQoL over follow-up periods. Individual social capital levels affected OHRQoL over the three follow-up assessments, while social capital at the community level had a long-term effect on OHRQoL, especially during adolescence.

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Figure legends

Figure 1. Overall OHRQoL scores according to social capital variables

Figure S1. Cohort study flowchart

Table 1. Demographic, socioeconomic, social capital, and oral health variables of the sample at baseline for individuals followed throughout 10 years

Variables	2010 (T1) (n=639)	2012 (T2) (n=469)	2017 (T3) (n=449)	2020 (T4) (n=429)
Sociodemographic variables				
Sex [n (%)]				
Boys	322 (49.0)	238 (50.7)	220 (47.5)	209 (49.8)
Girls	317 (51.0)	229 (49.3)	229 (52.5)	220 (50.2)
Skin colour				
White	501 (80.5)	363 (48.5)	347 (79.6)	330 (76.9)
No-white	137 (19.5)	103 (51.5)	102 (20.4)	99 (23.1)
Household income* [mean SE)]	1,204 (42.1)	1,105 (48.2)	2,174 (135.6)	1,116 (52.8)
Maternal education [n (%)]				
≥ 8 years	357 (54.3)	256 (54.1)	246 (54.6)	237 (55.2)
< 8 years	275 (45.7)	204 (45.9)	199 (45.4)	187 (44.8)
Contextual social capital				
Social class associations [n (%)]				
Absent	393 (68.8)	288 (61.4)	277 (62.8)	271 (63.2)
Present	245 (31.2)	178 (38.6)	172 (37.2)	158 (36.8)
Cultural community centres [n (%)]				
Absent	365 (64.4)	265 (56.5)	265 (56.5)	255 (59.4)
Present	273 (35.6)	201 (43.5)	184 (43.5)	174 (40.5)
Workers' associations [n (%)]				
Absent	413 (44.7)	298 (63.5)	284 (60.6)	272 (63.4)
Present	225 (55.3)	168 (36.5)	165 (39.4)	157 (36.5)
Individual social capital				
Attending religious meeting [n (%)]				
At least once a month	362 (56.0)	270 (57.6)	262 (58.4)	248 (58.7)
Less than once a month/never	276 (44.0)	196 (42.4)	187 (41.6)	181 (41.3)
Visit to friends/neighbours [n (%)]				
At least once a month	415 (67.0)	310 (66.1)	294 (62.7)	274 (63.8)
Less than once a month/ never	222 (33.0)	156 (33.9)	155 (37.3)	155 (36.1)
School involvement [n (%)]				
Yes	248 (39.1)	196 (41.8)	78 (16.3)	172 (40.6)
No	383 (60.9)	267 (58.2)	369 (83.7)	252 (59.4)
Oral health measures				
Untreated dental caries [n (%)]				
Absent	408 (61.6)	296 (63.1)	283 (60.3)	300 (69.4)
Present	231 (38.4)	171 (36.8)	166 (39.7)	128 (30.6)
*Outcome**				
OHRQoL [mean (SE)]	4.7 (0.5)	6.9 (0.9)	10.6 (0.7)	21.5 (1.2)

Taking into account the sampling weight; Values lower than general sample are due to missing data. SE, standard error; OHRQoL, oral health-related quality of life. *In Reais, R$ (US$1.00 is equivalent to R$5.4 approximately). *Measures of each cohort period.

Table 2. Multilevel Poisson Regression Adjusted analysis of the social capital predictors at baseline on OHRQoL over time

Variables	Oral health-related quality of life			
	2010 (T1)	**2012 (T2)**	**2017 (T3)**	**2020 (T4)**
	IRR (95%CI)*	**IRR (95%CI)***	**IRR (95%CI)***	**IRR (95%CI)***
Contextual social capital				
Social class associations				
Absent	1.00	1.00	**1.00**	**1.00**
Present	1.10 (0.84-1.45)	0.98 (0.61-1.74)	**0.79 (0.66-0.96)**	**0.77 (0.67-0.89)**
Cultural community centres				
Absent	1.00	1.00	1.00	1.00
Present	1.04 (0.78-1.38)	1.21 (0.71-2.02)	1.10 (0.91-1.33)	1.04 (0.90-1.20)
Workers' associations				
Absent	1.00	1.00	1.00	1.00
Present	0.81 (0.62-1.06)	1.29 (0.78-2.13)	0.90 (0.72-1.07)	0.92 (0.80-1.05)
Individual social capital				
Attending group religious meetings				
At least once a month	1.00	**1.00**	1.00	**1.00**
Less than once a month/ never	0.90 (0.82-1.01)	**1.28 (1.17-1.39)**	0.96 (0.90-1.03)	**1.05 (1.01-1.10)**
Visit to friends/neighbours				
At least once a month	**1.00**	1.00	**1.00**	**1.00**
Less than once a month/ never	**1.14 (1.04-1.26)**	0.93 (0.85-1.02)	**1.16 (1.08-1.24)**	**1.27 (1.21-1.33)**
School involvement				
Yes	1.00	1.00	**1.00**	1.00
No	0.89 (0.78-1.01)	0.96 (0.85-1.09)	**1.25 (1.17-1.33)**	0.97 (0.91-1.03)

IRR, incidence rate ratio; CI, confidence interval; *Adjusted by sex, skin colour, household income, maternal education and untreated dental caries; OHRQoL, oral health-related quality of life.

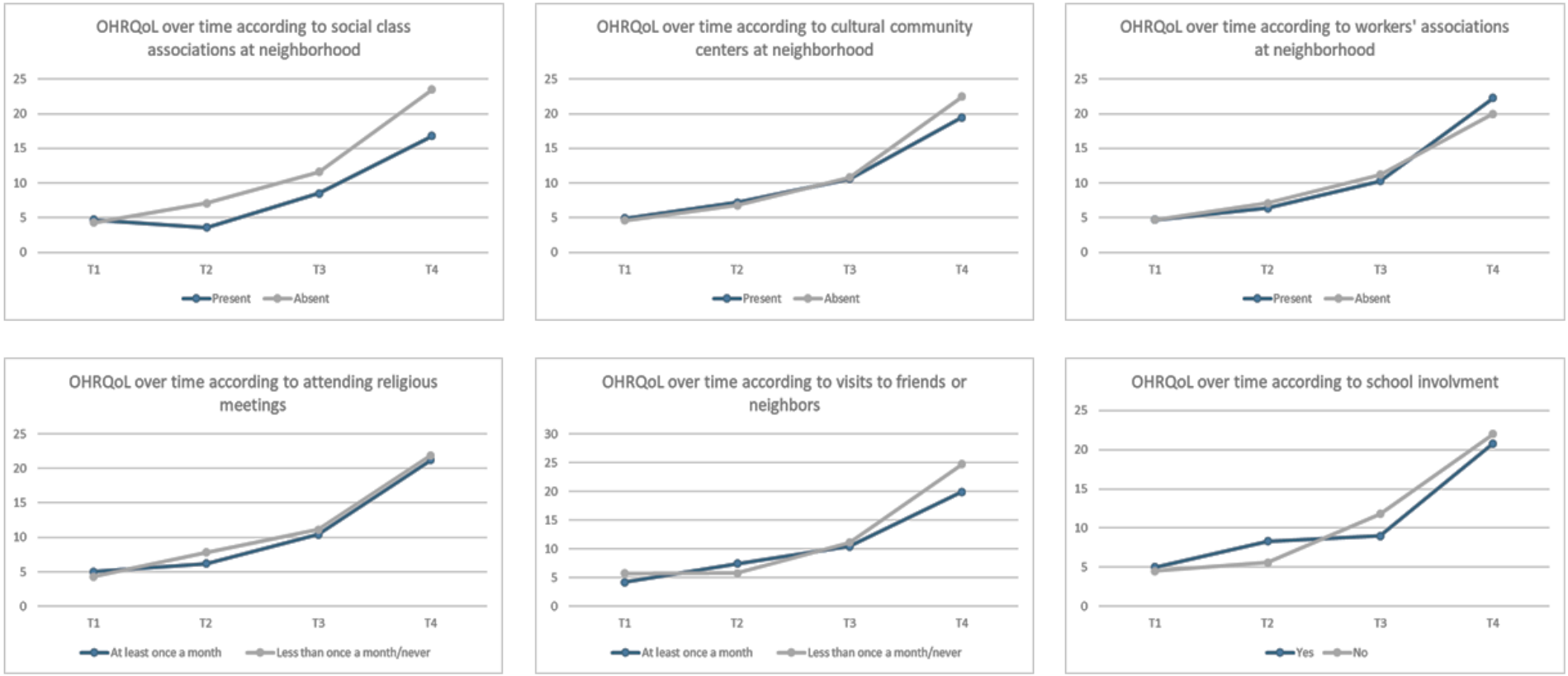

Figure 1. Overall OHRQoL scores according to social capital variables.

Supplementary material

Table S1. Contextual and individual social capital variables at baseline according to the overall OHRQoL scores in 2010, 2012, 2017, and 2020

Variables	Oral health-related quality of life			
	2010 (T1)	**2012 (T2)**	**2017 (T3)**	**2020 (T4)**
	Mean (SE)	**Mean (SE)**	**Mean (SE)**	**Mean (SE)**
Contextual social capital				
Social class associations				
Absent	4.7 (0.8)	7.1 (1.3)	11.6 (0.9)	23.5 (1.6)
Present	4.7 (0.5)	3.6 (0.8)	8.5 (0.5)	16.8 (1.1)
Cultural community centres				
Absent	4.6 (0.7)	6.8 (1.2)	10.8 (0.9)	22.5 (1.7)
Present	4.9 (0.8)	7.2 (1.0)	10.6 (0.8)	19.5 (1.2)
Workers' associations				
Absent	4.7 (0.6)	6.4 (0.8)	11.2 (0.7)	20.0 (1.0)
Present	4.7 (0.8)	7.1 (1.4)	10.3 (1.0)	22.6 (1.9)
Individual social capital				
Attending religious meeting				
At least once a month	5.0 (0.9)	6.2 (1.0)	10.4 (0.7)	21.2 (1.6)
Less than once a month/never	4.3 (0.6)	7.8 (1.7)	11.0 (1.2)	21.9 (1.7)
Visit to friends/neighbours				
At least once a month	4.2 (0.6)	7.4 (1.3)	10.4 (0.7)	19.9 (1.4)
Less than once a month/never	5.7 (1.1)	5.8 (1.1)	11.1 (1.5)	24.7 (2.1)
School involvement				
Yes	5.0 (1.0)	8.3 (1.8)	9.0 (0.9)	20.8 (2.0)
No	4.5 (0.6)	5.6 (0.9)	11.8 (0.9)	22.0 (1.5)

Taking into account the sampling weight; SE, standard error; OHRQoL, oral health-related quality of life.

Table S2. Multilevel Poisson Regression Unadjusted analysis of the social capital predictors at baseline on OHRQoL over time

Variables	Oral health-related quality of life			
	2010 (T1)	**2012 (T2)**	**2017 (T3)**	**2020 (T4)**
	IRR (95%CI)*	**IRR (95%CI)***	**IRR (95%CI)***	**IRR (95%CI)***
Contextual social capital				
Social class associations				
Absent	1.00	1.00	**1.00**	**1.00**
Present	1.03 (0.72-1.47)	0.98 (0.57-1.67)	**0.72 (0.59-0.89)**	**0.75 (0.67-0.85)**
Cultural community centres				
Absent	1.00	1.00	1.00	1.00
Present	1.09 (0.76-1.57)	1.13 (0.66-1.94)	0.98 (0.75-1.28)	0.96 (0.79-1.16)
Workers' associations				
Absent	1.00	1.00	1.00	1.00
Present	0.88 (0.61-1.26)	1.16 (0.68-1.98)	0.81 (0.63-1.03)	0.91 (0.75-1.07)
Individual social capital				
Attending group religious meetings				
At least once a month	1.00	**1.00**	1.00	**1.00**
Less than once a month/ never	0.81 (0.72-0.92)	**1.14 (1.02-1.29)**	1.02 (0.96-1.08)	**1.02 (0.96-1.08)**
Visit to friends/neighbours				
At least once a month	**1.00**	1.00	**1.00**	**1.00**
Less than once a month/ never	**1.27 (1.12-1.43)**	0.97 (0.86-1.11)	**1.18 (1.11-1.26)**	**1.26 (1.18-1.34)**
School involvement				
Yes	**1.00**	**1.00**	**1.00**	1.00
No	**0.70 (0.62-0.79)**	**0.85 (0.76-0.96)**	**1.26 (1.18-1.34)**	1.01 (0.94-1.06)

IRR, incidence rate ratio; CI, confidence interval; OHRQoL, oral health-related quality of life.

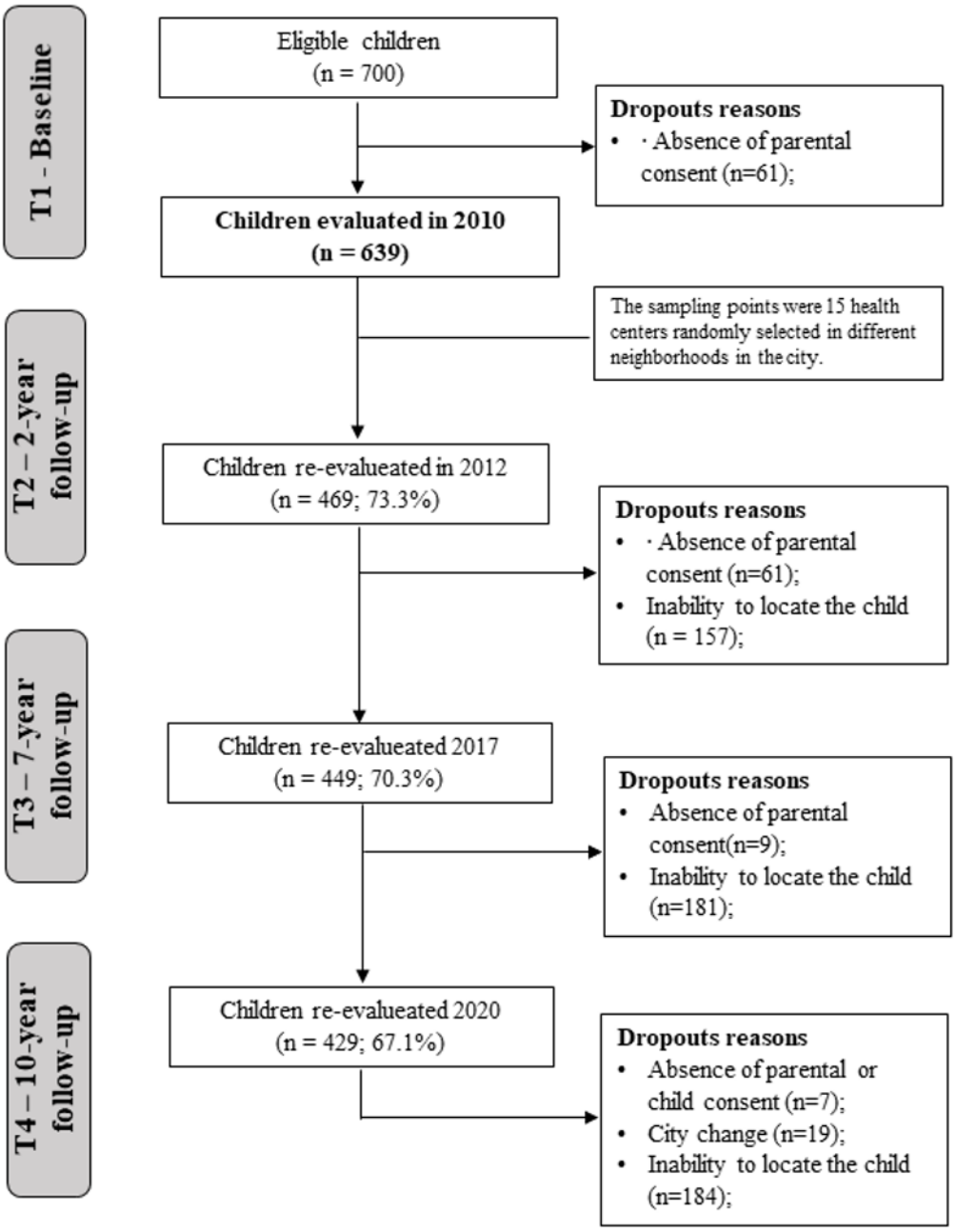

Figure S1. Cohort study flowchart

7 DISCUSSÃO

Essa tese teve como objetivo avaliar o efeito do capital social na saúde bucal de crianças e adolescentes a partir de quatro artigos científicos. Com base nos achados gerais desses estudos, observou-se que altos níveis de capital social impactaram positivamente em desfechos normativos e subjetivos de saúde bucal em crianças e adolescentes. Em relação aos níveis de influência do capital social, os resultados demonstraram que o nível comunitário exerceu um efeito cumulativo e de maior impacto na saúde bucal, sendo que essa relação também foi mediada por fatores comportamentais, psicossociais e de acesso aos serviços de saúde. A relação entre o capital social individual e saúde bucal foi relacionada especialmente aos fatores psicossociais, representados pelo SDC, o qual atuou como um caminho indireto e também como um modificador de efeito nessa relação. Todos os períodos da infância à adolescência são relevantes em termos de capital social, mas o último parece ser particularmente importante para atuação em recursos psicossociais promotores de saúde.

Nossos achados estão de acordo com a literatura prévia que avaliou o impacto do capital social em desfechos normativos e subjetivos de saúde bucal em crianças e adolescentes (FONTANINI; MARSHMAN; VETTORE, 2015; TOMAZONI et al. 2017; VETTORE et al. 2019; KNORST et al. 2019; FOLAYAN et al. 2020; FERREIRA et al. 2021). Altos níveis de capital social podem influenciar nos comportamentos relacionados à saúde bucal por meio das normas sociais e controle social informal, bem como através da disseminação de normas saudáveis entre os indivíduos em uma rede social ou na comunidade (KAWACHI, BERKMAN; 2000; ROUXEL et al. 2015). Em adição, o capital social também pode atuar como um fator protetor ao estresse através do apoio social, o qual gera sentimentos de segurança e pertencimento (ROUXEL et al. 2015). Assim, viver num bairro com maior apoio social, ou poder usufruir de boas redes sociais tem sido fortemente associado a melhores comportamentos em saúde bucal e menor stress psicossocial, o que impacta positivamente na saúde bucal (BURR; LEE, 2012; GUPTA et al. 2015; MATO et al. 2017; TOMAZONI et al. 2019).

Um dos principais debates ainda existentes na literatura do capital social é o fato de ele ser um recurso individual ou comunitário (BORDIEU, 1986; COLEMAN, 1988; PUTNAM et al. 1993). No entanto, abordagens modernas têm definido o capital social como um atributo em ambos os níveis (ROSTILA, 2011 KAWACHI; SUBRAMANIAN; KIM, 2008). Os achados da tese, em geral, demonstraram um impacto do nível comunitário e individual na saúde bucal normativa e subjetiva de crianças e adolescentes. No entanto, o capital social em nível comunitário teve um efeito mais acentuado e cumulativo, assim como evidenciado nos artigos

1, 2 e 4. Esses resultados podem ser explicados pela teoria do acúmulo de risco ao longo da vida (HELIMANN et al., 2015), além do fato que a privação de capital social comunitário também pode estar intimamente relacionada a outros aspectos estruturais da comunidade, como a renda e coesão social (DIEZ-ROUX et al. 2010; SISSON, 2007; SOLAR; IRWIN, 2010). Ainda, as variáveis em nível comunitário tendem a ser mais engessadas e complexas de serem mudadas a curto prazo, pois dependem de políticas públicas e aspectos organizacionais de cada comunidade ou município (DIEZ-ROUX et al., 2010). Nesse contexto, o capital social ao qual os indivíduos foram expostos na primeira infância tende a se perpetuar ao longo do tempo, independentemente da exposição aos fatores de risco individuais.

O capital social em nível comunitário também exerceu um efeito indireto na saúde bucal. As principais teorias que explicam a ligação entre capital social e saúde em micro níveis são a teoria comportamental, teoria psicossocial, e a teoria de acesso aos serviços de saúde (ROUXEL et al., 2015). Os achados do artigo 2 evidenciaram que o capital social comunitário impactou na saúde bucal normativa (cárie dentária) ao longo do tempo através da via psicossocial (SDC), comportamental (frequência de escovação) e de acesso aos serviços de saúde (frequência de uso de serviços odontológicos). A via comportamental reconhece que o capital social pode influenciar comportamentos de saúde por meio de normas, controle social informal e disseminação de hábitos saudáveis (ROUXEL et al. 2015), como a maior frequência de escovação dentária, considerada um fator de proteção para a cárie dentária (KUMAR et al. 2016). A via psicossocial considera que altos níveis de capital social exercem um impacto protetor sobre a saúde, diminuindo o estresse e favorecendo estratégias naturais de enfrentamento natural e SDC das pessoas (ROUXEL et al. 2015), o qual também tem sido relacionado à ocorrência de cárie dentária (TOMAZONI et al 2019). A via do acesso aos serviços de saúde explica que comunidades com altos níveis de capital social são mais engajadas na busca por serviços de saúde e atendimento (ROUXEL et al. 2015), o que também tem sido associado à cárie dentária (HASHIM et al. 2006).

Como mencionado previamente, o capital social individual impactou nos desfechos de saúde bucal, porém não seguiu um padrão. Os achados dos artigos 1 e 2 da tese demonstraram que ele atuou principalmente em associações avaliadas ao mesmo tempo, como por exemplo em estudos transversais incluídos na revisão sistemática, ou dentro da mesma onda dessa coorte. No artigo 3 e 4, o capital social individual impactou ao longo do tempo, porém não seguiu um padrão consistente. Esse achado pode ser explicado devido ao fato que os níveis de capital social individual podem mudar ao longo do tempo, além de serem variáveis de acordo com o

gênero e as experiências pessoais (MCDONALD; MAIR 2010). Em adição, considerando os artigos da coorte (2, 3 e 4), cabe ressaltar que o capital social individual da linha de base foi mensurado através dos pais, o que pode não refletir a percepção atual do adolescente, nem refletir em padrões sólidos ao longo dos acompanhamentos.

Nossos achados também demonstraram que o capital social individual teve um efeito indireto na saúde bucal. Os resultados do artigo 2 evidenciaram que a saúde bucal subjetiva (QVRSB) foi afetada indiretamente pelo capital social individual através da via psicossocial, representada pelo SDC. Esse fator psicossocial pode ser definido como uma orientação global que permite com que as pessoas gerenciam o estresse e encontrem soluções para a sua saúde (ANTONOVSKY, 1987). Tem sido sugerido que o SDC interage com o estilo natural de enfrentamento e apoio social de uma pessoa. Assim, a extensão das redes e a confiança social podem interagir com os níveis de SDC do indivíduo (GUPTA et al. 2015). Evidências anteriores mostraram que indivíduos com alto SDC apresentaram melhor QVRSB (BAKER et al. 2010), especialmente em termos do quanto uma pessoa é capaz de lidar com os seus problemas de saúde. Portanto, supõem-se que níveis mais altos de redes sociais e confiança social durante a adolescência podem impactar positivamente na QVRSB por meio do SDC.

No entanto, estudos anteriores também demostraram que o SDC pode apresentar um efeito moderador na qualidade de vida geral e na QVRSB, considerando outros preditores, como a necessidade de prótese dentária e cárie dentária (MACHADO et al. 2017; QIU et al. 2019). Assim, uma vez que o SDC é um fator relacionado a resiliência e enfrentamento das pessoas (ANTONOVSKY, 1987), supomos que ele também poderia atuar como um fator atenuador do impacto causado pela privação de capital social na saúde bucal. Para responder essa questão, o estudo 3 foi conduzido e os seus resultados evidenciaram que entre os indivíduos que apresentavam baixo capital social individual, aqueles com níveis moderados e altos de SDC apresentaram menor impacto na sua QVRSB do que aqueles com baixo SDC. Esse efeito foi observado considerando o capital social na primeira infância e na adolescência, com o efeito maior sendo observado nesse último período. Assim, apesar de possuírem baixo capital social, indivíduos mais resilientes tendem a se sentir menos afetados pelos problemas bucais (TOMAZONI et al. 2018; BAKER et al. 2010), o que tende a refletir em uma melhor QVRSB.

No contexto dos artigos 2 e 3, cabe ressaltar brevemente a diferença entre os fatores mediadores (ou caminhos) e moderadores. Na análise de caminhos, o principal pressuposto é entender porque alguma relação entre o preditor e desfecho acontece. Nesse sentido, a variável mediadora ou via, é aquela que fica no caminho da associação entre duas variáveis, explicando

um efeito indireto que ocorre entre elas (KLINE, 2010; IGARTUA; HAYES, 2021). Por outro lado, os efeitos de moderação ocorrem quando a relação entre duas variáveis varia de acordo com o nível (por exemplo alto ou baixo) de uma terceira variável, que é referida como a variável moderadora. Geralmente, o efeito de uma variável moderadora é estatisticamente caracterizado como uma interação; ou seja, uma variável que afeta a direção e/ou força da associação entre a variável dependente e independente (IGARTUA; HAYES, 2021). Os achados dessa tese sugerem que o SDC pode atuar tanto como um caminho como também um fator moderador do efeito entre o capital social individual e QVRSB. Assim, enfatiza-se a necessidade de mais estudos considerando esses fatores para elucidar essa questão.

Os estudos dessa tese também englobaram diferentes desfechos de saúde bucal, tanto normativos como subjetivos. Os achados da revisão sistemática (artigo 1) demonstraram que o capital social tem sido associado a diferentes desfechos em saúde bucal em crianças e adolescentes, sendo eles a cárie dentária, sangramento gengival, autopercepção de saúde bucal e QVRSB. Os resultados da metanálise demostraram que agrupados, os desfechos normativos (cárie e sangramento gengival) e subjetivos (autopercepção de saúde bucal e QVRSB) foram impactados pelo capital social, sendo nos desfechos subjetivos o maior efeito observado. Considerando os desfechos separadamente, apenas a cárie dentária e QVRSB foram associadas aos níveis de capital social. Com base nesses achados compilados, foram conduzidos os demais artigos da tese, considerando os desfechos mais significativos (artigo 2 – cárie e QVRSB), com uma ênfase maior no que sofreu um maior impacto do capital social (artigo 3 e 4 – QVRSB).

Outro fator importante a ser considerado nessa tese se refere aos diferentes indicadores de capital social e seus efeitos na saúde. Sabe-se que o constructo do capital social é complexo e não pode ser medido diretamente (ROSTILA et al. 2011) e, por essa razão, o capital social é comumente medido através de indicadores ou "proxies", tanto em nível individual como comunitário (PAXTON, 1999; ROSTILA, 2011). Nos artigos da tese, os indicadores foram utilizados de diferentes maneiras, tanto isolados, como na forma de variável latente ou até mesmo agrupados, sendo que de todas as formas foram associados aos desfechos de saúde bucal. Considerando especificamente os artigos 1 e 4, onde os indicadores foram isolados, em geral, foi observado um grande impacto das redes sociais individuais, especialmente as que envolvem redes de amigos, vizinhos ou familiares. Isso pode ser explicado pelo fato que esse tipo de vínculo é normalmente o mais comum, acessível, forte e duradouro que pode ocorrer entre os indivíduos, gerando uma confiança espessa e mútua (BORDIEU, 1986; COLEMAN 1988; ROSTILA et al. 2011), especialmente na infância e adolescência. Nesse sentido, esse

indicador é um forte proxy para redes sociais individuais e pode ter um impacto muito positivo na saúde bucal. No entanto, ressalta-se que os diversos indicadores, tanto em nível comunitário como individual, são válidos e podem ser utilizados na mensuração do capital social.

Considerando os diferentes grupos etários, os achados da tese demonstraram que o capital tem potencial de impactar nos desfechos de saúde bucal tanto em crianças como em adolescentes. Os achados do artigo 2 e 4 enfatizaram que a privação de capital social em nível comunitário na primeira infância impactou negativamente na saúde bucal na adolescência. Em adição, os resultados obtidos em todos os artigos da tese demonstraram um impacto do capital social em nível individual notadamente forte no período da adolescência. Nesse sentido, é importante enfatizar que esse período é crucial para a atenção em saúde, uma vez que é caracterizado por inúmeras mudanças biológicas, psicossociais e adaptações às estruturas sociais (SILVEIRA et al., 2014). Nessa fase, os indivíduos também se encontram vulneráveis a diversos fatores de risco à saúde, os quais podem persistir ao longo da vida adulta (HOLST; SCHULLER, 2012; SILVEIRA et al., 2014; STRAATMANN et al., 2019).

Os estudos que compõe essa tese apresentam algumas limitações. Considerando todos os artigos, a principal limitação foi a utilização de indicadores de capital social, os quais podem não representar integralmente o seu construto (PAXTON, 1999; ROSTILA, 2011). No entanto, os indicadores de capital social adotados nessa tese têm sido amplamente utilizados e são considerados medidas válidas de acordo com estudos anteriores (HYYPPÄ; MAKI, 2001; AIDA et al., 2008; STORY et al., 2015). Considerando especificamente o artigo 1 (revisão sistemática), cabe ressaltar como limitação o agrupamento de diferentes desfechos em saúde bucal e a alta heterogeneidade na metanálise. No entanto, foi realizada uma análise de subgrupos e posterior metaregressão para explicar esses fatores. Considerando os artigos 2, 3 e 4 (estudos da coorte), algumas limitações também precisam ser destacadas. Primeiramente, as medidas de capital social foram obtidas dos pais no início do estudo e dos adolescentes no seguimento, o que pode ter influenciado nos achados. Segundo, alguns adolescentes foram reavaliados antes e outros durante a pandemia de COVID-19, o que pode ter introduzido um viés de resposta em relação a comportamentos e fatores psicossociais, os quais foram impactados pela pandemia (BRONDANI et al. 2021; KNORST et al. 2021). No entanto, análises de sensibilidade mostraram que essa preocupação não afetou os nossos resultados. Por fim, consideramos apenas algumas variáveis explicativas para representar as vias teóricas e fator moderador no artigo 2 e 3. Assim, deve-se reconhecer que outros fatores psicossociais, comportamentais ou de acesso aos serviços de saúde poderiam atuar nessas relações.

Alguns pontos fortes também devem ser destacados. A revisão sistemática incluiu diferentes bases de dados e abrangeu diferentes desfechos de saúde bucal, podendo compilar a literatura recente da associação entre capital social e saúde bucal em crianças e adolescentes. Os demais artigos dessa tese (estudos 2, 3 e 4) são parte de um estudo de coorte prospectivo que apresentou uma boa taxa de resposta após 10 anos de acompanhamento (67,1%), indicando a validade de nossos achados. Além disso, essa tese teve como potencial de impacto avaliar a influência de fatores sociais em desfechos normativos e subjetivos de saúde bucal na transição da infância para a adolescência, um importante período de desenvolvimento biopsicossocial na vida dos indivíduos (SILVEIRA et al., 2014; STRAATMANN et al., 2019), especialmente daqueles com pior condição socioeconômica e mais acometidos pelas doenças bucais. Portanto, uma maior compreensão dos determinantes sociais e dos caminhos causais envolvidos no processo saúde-doença nesse período foram elucidadas.

Nesse contexto, estratégias que visem a implementação de instituições formais nos bairros, bem como intervenções visando melhorar as redes sociais e a confiança entre os indivíduos são incentivadas, pois podem impactar positivamente nos desfechos de saúde bucal, especialmente perante desigualdades não justas. Além disso, a atuação em recursos pessoais e na capacidade de gerar saúde, como por exemplo no SDC, também é encorajada, especialmente no período da adolescência. Assim, os achados dessa tese fornecem evidências para o desenvolvimento de ações de promoção da saúde bucal com foco em fatores distais, objetivando reduzir o impacto das desigualdades sociais na saúde bucal na infância e adolescência.

8 CONCLUSÃO

Com base nos achados dessa tese, conclui-se que altos níveis de capital social impactam positivamente em desfechos normativos e subjetivos de saúde bucal em crianças e adolescentes. O capital social comunitário exerceu um efeito cumulativo e de maior impacto nos desfechos de saúde bucal ao longo do tempo, enquanto que o capital social individual teve um papel especialmente importante no período da adolescência. Os fatores psicossociais foram determinantes chave na relação entre capital social e saúde bucal. Assim, enfatiza-se a necessidade de atuação nos determinantes sociais da saúde na infância e adolescência.

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APÊNDICE A – QUESTIONÁRIO DEMOGRÁFICO E SOCIOECONÔMICO

QUESTIONÁRIO DEMOGRÁFICO E SOCIOECONÔMICO

Nome: _____ **Idade**:_____
Endereço: _____
Bairro: _____
Telefone: _____
Escola: _____

Questionário demográfico e socioeconômico

1) De que raça você considera o seu filho?
( ) Branco ( ) Parda ( ) Preta ( ) Amarela ( ) Indígena

2) Seu filho já sofreu algum tipo de descriminação racial?
( ) Não ( ) Sim

3) Estrutura familiar - você mora com?
( ) Pai e mãe ( ) Só com a mãe ( ) Só com o pai ( ) Com outra pessoa

4) Quantos cômodos tem na sua casa (exceto banheiro)? _____

5) Contando com você, quantas pessoas moram na sua casa ou apartamento?_____

6) Qual é o rendimento mensal, em reais, de todos que moram na casa? _____

7) Escolaridade materna:
( ) Não estudou ( ) 1° grau incompleto ( ) 1° grau completo ( ) 2° grau incompleto
( ) 2° grau completo ( ) 3° grau incompleto ( ) 3° grau completo

Questionário comportamental (higiene e uso de serviços)

8) No último mês, quantas vezes por dia você escovou os seus dentes?
( ) Não escovo os meus dentes diariamente ( ) Uma vez por dia ( ) Duas vezes por dia
( ) Três vezes por dia ( ) Quatro ou mais vezes por dia

9) Você utiliza fio dental?
( ) Não utilizo ( ) Menos de uma vez ao dia (utilizo somente alguns dias) ( ) 1 vez por dia.

10) No último ano (12 meses) quantas vezes você foi ao dentista?
( ) Nenhuma vez ( ) 1 vez ( ) 2 vezes ( ) 3 vezes

11) Qual foi o motivo da última consulta?
( ) Dor de dente ( ) Dor na boca; ( ) Batidas e quedas ( ) Exame e rotina ( ) Aparelho
( ) Outros:_____ ( ) Nunca fui.

12) Qual foi o tipo de serviço que você procurou na última consulta?
( ) Dentista particular ( ) Dentista público (posto de saúde, faculdade, escola).

13) Você acha que necessita de tratamento dentário atualmente?
( ) Não ( ) Sim

14) Com que frequência você consome alimentos ou bebidas açucaradas?
( ) Três ou mais vezes por dia ( ) Duas vezes por dia ( ) Pelo menos uma vez por dia
( ) Menos de uma vez por dia ( ) Nunca ou quase nunca

APÊNDICE B – QUESTIONÁRIO PARA AVALIAÇÃO DO CAPITAL SOCIAL

Capital social individual

LINHA DE BASE (T1)

1) Você pratica alguma atividade religiosa? ( ) Sim ( ) Não;
Se sim, qual? _____

2) Com que frequência você pratica atividades religiosas? ( ) Todos os dias ou quase todos os dias; ( ) Uma vez na semana; ( ) Uma vez ao mês; ( ) Uma vez a cada 3 meses; ( ) Nunca ou quase nunca

3) Nos últimos 12 meses com que frequência você visitou alguém da família ou alguém da família visitou você? ( ) Mais de uma vez por mês; ( ) Pelo menos uma vez por mês; ( ) Menos de uma vez por mês; ( ) Nunca ou quase nunca

4) Nos últimos 12 meses com que frequência você visitou algum amigo ou vizinho ou algum amigo ou vizinho visitou você? ( ) Mais de uma vez por mês; ( ) Pelo menos uma vez por mês; ( ) Menos de uma vez por mês; ( ) Nunca ou quase nunca

5) Você participa de algum grupo voluntário? ( ) Sim ( ) Não

6) Você participa de algum grupo comunitário? ( ) Sim ( ) Não

7) Você participa das atividades escolares do seu filho? ( ) Sim ( ) Não

ACOMPANHAMENTO DE 10 ANOS (T4)

1) Você pratica alguma religião? ( )Não ( )Sim, menos de uma vez por mês ( )Sim, pelo menos uma vez por mês

2) Você visitou algum amigo, vizinho ou familiar ou algum deles visitou você nos últimos 12 meses?
( )Não ( )Sim, menos de uma vez por mês ( )Sim, pelo menos uma vez por mês

3) Nos últimos 12 meses, você foi membro de algum grupo voluntário ou algo do tipo? ( ) Sim ( ) Não

4) Caso tenha algo infeliz acontecendo com você, alguém te ajudaria nessa situação? ( ) Sim ( ) Não

5) Nos últimos 12 meses, você se uniu a outras pessoas em sua vizinhança ou bairro para tratar de questões importantes e de interesse geral? ( ) Sim ( ) Não

6) Seus vizinhos e amigos podem ser confiáveis? ( ) Sim ( ) Às vezes ( ) Não

7) A maioria das pessoas no seu bairro geralmente tem boas relações umas com as outras? ( ) Sim ( ) Às vezes ( ) Não

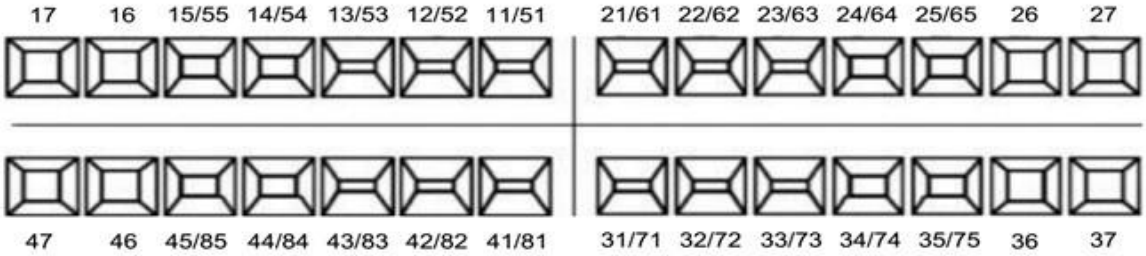
APÊNDICE C –FICHA CLÍNICA

UNIVERSIDADE FEDERAL DE SANTA MARIA
CENTRO DE CIÊNCIAS DA SAÚDE
Programa de Pós- Graduação em Ciências Odontológicas - UFSM

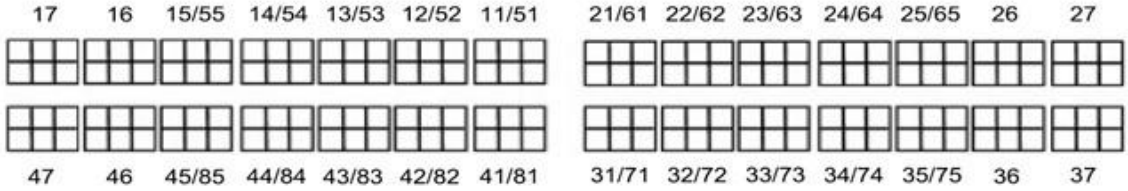
PPGCO

Nome:_____ Data do Exame: _____/_____/_____
Examinador:_____ Anotador:_____
Local do exame: ( ) Escola ( ) Casa ( ) Clínica Aparelho ortodôntico: ( ) Sim ( ) Não

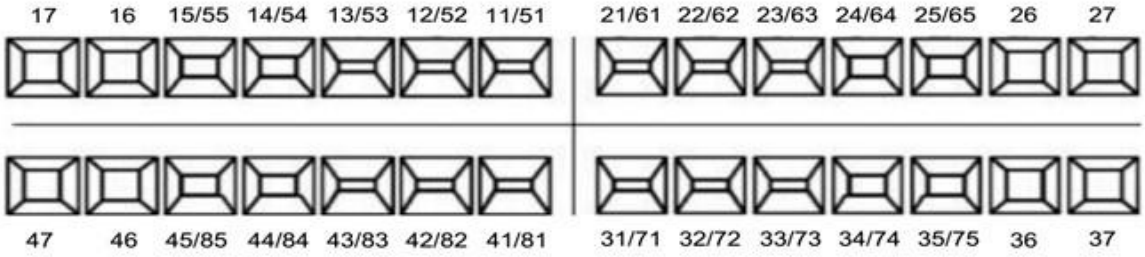
1. Placa (IPV)



2. Sangramento Gengival (IPC)



3. Exame de Cárie + Restaurações (ICDAS)



4. Traumatismo Dentário

☐ ☐ ☐ ☐
12/52 11/51 21/61 22/62

5. Dor de dente no último ano

☐ Sim ☐ Não

6. Maloclusão (DAI)

DENTIÇÃO

☐☐

S I

Número de Incisivos, Caninos e Pré-molares perdidos

ESPAÇO

☐ Apinhamento na região de incisivos

☐ Espaçamento na região de incisivos

☐ Diastema em mm

☐ Desalinhamento maxilar anterior em mm

☐ Desalinhamento mandibular anterior em mm

OCLUSÃO

☐ Overjet maxilar anterior em mm

☐ Overjet mandibular anterior em mm

☐ Mordida aberta vertical anterior em mm

☐ Relação molar ântero-posterior

APÊNDICE D – TERMO DE ASSENTIMENTO

Termo de Assentimento

Título do estudo: **Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos**

Pesquisador responsável: Professor Dr. Thiago Machado Ardenghi
Instituição: Universidade Federal de Santa Maria/Departamento de Estomatologia
Telefone e endereço: 55-3220-9272. Av. Roraima - Camobi, Santa Maria - RS – 2º andar (Odontopediatria) - Universidade Federal de Santa Maria. CEP 97105-900 - Santa Maria - RS.

Eu, Thiago Machado Ardenghi, professor do Curso de Odontologia da Universidade federal de Santa Maria (UFSM), junto à minha aluna de doutorado, Jessica Klöckner Knorst, estou realizando uma pesquisa para conhecer a saúde dos dentes e da boca de escolares de 11 a 15 anos de nossa cidade. Você está sendo convidado (a) para participar desta pesquisa. Seus pais já permitiram a sua participação, mas se você estiver com dúvidas, pode conversar com alguém antes de decidir participar ou não. Você não precisa participar se não quiser, é um direito seu e não terá nenhum problema se decidir desistir.

O objetivo de nossa pesquisa é avaliar a influência de fatores sociais individuais e contextuais na saúde bucal de 11 a 15 anos ao longo do tempo. Além disso, nós queremos saber, também, quais características os participantes da pesquisa têm.

A pesquisa será desenvolvida na clínica de Odontopediatria da UFSM e na sua escola e, caso avaliarmos necessário, nós iremos até sua casa. A aluna de Doutorado fará uma avaliação da sua boca, usando apenas um espelho odontológico e uma sonda. Você, também, responderá a algumas perguntas sobre sua saúde bucal.

Como esta pesquisa se trata apenas de uma entrevista e um exame de sua boca, os riscos são mínimos. Você poderá ficar cansado (a) ao fazer o exame. Se isso acontecer, você poderá descansar alguns minutos para que a avaliação seja então retomada. Você poderá ficar com vergonha de responder alguma pergunta. Caso isto ocorra, as perguntas poderão não ser respondidas. O exame poderá ser cancelado e você poderá se recusar a participar da pesquisa a qualquer momento sem que haja qualquer problema. Você não receberá benefícios diretos com a pesquisa, mas, como benefício indireto, se você precisar de algum tratamento em algum dente, será encaminhado para atendimento. Você não receberá nem dinheiro e nem presentes por sua participação.

Ninguém saberá que você está participando da pesquisa, não falaremos a outras pessoas, nem daremos a estranhos as informações que você nos der. Os resultados da pesquisa serão publicados, mas sem identificar as crianças que participaram da pesquisa. Eu coloquei números de telefones na parte debaixo deste documento para que seus pais possam falar comigo ou com o Comitê de Ética em pesquisa

em seres humanos, que é composto por um grupo de pessoas que trabalham para garantir que seus direitos como participante de pesquisa sejam respeitados.

Autorização

Eu, aceito participar da pesquisa "Influência do capital social no desenvolvimento do senso de ar

 is

no dentista. Entendi as coisas ruins e coisas boas que podem acontecer. Entendi que posso dizer "sim" e participar, mas que, a qualquer momento, posso dizer "não" e desistir que ninguém vai ficar bravo. Os pesquisadores tiraram minhas dúvidas e conversaram com meus pais ou responsáveis por mim. Recebi uma cópia deste documento e li e concordo em participar da pesquisa.

Santa Maria, RS, ____ de _____ de 201__.

Nome legível do escolar: _____

Assinatura do escolar: _____

Qualquer esclarecimento entre em contato com:

Comitê de Ética em Pesquisa da Universidade Federal de Santa Maria:

Av. Roraima, 1000 – Prédio da Reitoria, 2º andar - CEP: 97105-900 – Santa Maria – RS

Telefones: (55) 3220 9362 e-mail: cep.ufsm@gmail.com

Jessica Klöckner Knorst (pesquisadora responsável):

Telefone: (55) 9 96739505

E-mail: jessicaknorst1@gmail.com

Prof. Dr. Thiago Machado Ardenghi (Orientador da pesquisa):

Universidade Federal de Santa Maria

Av. Roraima - Camobi, Santa Maria - RS – 2º andar (Odontopediatria) - Universidade Federal de Santa Maria. CEP 97105-900 - Santa Maria - RS.

Telefone 55-3220-9272.

APÊNDICE E – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Termo de Consentimento Livre e Esclarecido

Título do estudo: **Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos**

Pesquisador responsável: Professor Dr. Thiago Machado Ardenghi

Instituição: Universidade Federal de Santa Maria/Departamento de Estomatologia

Telefone e endereço: 55-3220-9272. Av. Roraima - Camobi, Santa Maria - RS – 2º andar (Odontopediatria) - Universidade Federal de Santa Maria. CEP 97105-900 - Santa Maria - RS.

Este termo tem como objetivo informar, esclarecer, pedir a sua autorização e convidar o(a) Sr./Sra. e seu/sua filho(a) a participarem da pesquisa intitulada **"Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos"** a ser desenvolvida pela Cirurgiã-dentista Jessica Klöckner Knorst e pelo professor Dr. Thiago Machado Ardenghi. Esta pesquisa tem como objetivo avaliar as inter-relações longitudinais entre fatores sociais individuais e contextuais no senso de coerência e nas condições de saúde bucal de escolares no município de Santa Maria, RS, Brasil.

A pesquisa será desenvolvida na Clínica de Odontopediatria da Universidade Federal de Santa Maria (UFSM) e, caso não seja possível o comparecimento na clínica, os pesquisadores irão até a escola do seu filho ou até a sua casa. Uma aluna de Doutorado do Curso de Odontologia da UFSM fará um exame da boca do seu/sua filho (a), usando apenas um espelho odontológico e uma sonda. O Sr/Sra. responderá a algumas perguntas relacionadas à saúde bucal do seu (sua) filho (a) e sobre as características familiares como, escolaridade, hábitos de higiene e renda da família.

O escolar ou o Sr./Sra. não receberão nenhum benefício direto com a pesquisa. Como nesta pesquisa serão realizados exames odontológicos, o risco previsto pela participação de seu/sua filho (a) é mínimo, entretanto, ele (a) poderá ficar cansado (a) ao responder os questionários e durante os exames clínicos. Como benefício, o Sr. (Sra.) será informado e orientado a procurar assistência odontológica caso seja observado algum problema durante o exame do (a) seu/sua filho (a). Cabe repetir que o (a) Sr. (Sra.) será orientado a procurar um atendimento, não sendo de responsabilidade desta pesquisa dar garantia de que este atendimento seja realizado. Não haverá qualquer custo para fazer parte deste estudo. O escolar ou o Sr./Sra. não receberão qualquer remuneração por essa participação.

Todos os dados de identificação de seu/sua filho (a) serão mantidos em sigilo. O Sr (Sra) e seu/sua filho (a) poderão se recusar participar da pesquisa a qualquer momento, sem que haja qualquer problema. Para esclarecer qualquer dúvida, o (a) senhor (a) poderá falar com o pesquisador pelo telefone escrito no final deste documento.

Autorização

Eu, acredito ter sido suficientemente informado a respeito das informações que li ou que foram lidas para mim. Ficaram claros para mim quais são os propósitos do estudo, os procedimentos a serem realizados, seus desconfortos e riscos, as garantias de confidencialidade e de esclarecimentos permanentes. Ficou claro também que minha participação é isenta de despesas. Concordo voluntariamente em participar deste estudo e poderei retirar o meu consentimento a qualquer momento, antes ou durante o mesmo, sem penalidades ou prejuízo ou perda de qualquer benefício que eu possa ter adquirido, ou no meu atendimento neste serviço. Recebi uma cópia deste termo de consentimento livre e esclarecido e me foi dada a oportunidade de ler e esclarecer as minhas dúvidas.

Declaro que fui devidamente esclarecido (a), e estou de acordo com os termos acima expostos, autorizando a participação minha e a do meu/minha filho(a) nesta pesquisa.

Santa Maria, RS, ____ de _____ de 201__.

Nome legível do escolar: _____

Nome legível do responsável: _____

Assinatura do responsável: _____

Qualquer esclarecimento entre em contato com:

Comitê de Ética em Pesquisa da Universidade Federal de Santa Maria:

Av. Roraima, 1000 – Prédio da Reitoria, 2º andar - CEP: 97105-900 – Santa Maria – RS

Telefones: (55) 3220 9362 e-mail: cep.ufsm@gmail.com

Jessica Klöckner Knorst (pesquisadora responsável):

Telefone: (55) 9 96739505

E-mail: jessicaknorst1@gmail.com

Prof. Dr. Thiago Machado Ardenghi (Orientador da pesquisa):

Universidade Federal de Santa Maria

Av. Roraima - Camobi, Santa Maria - RS – 2º andar (Odontopediatria) - Universidade Federal de Santa Maria. CEP 97105-900 - Santa Maria - RS.

Telefone 55-3220-9272.

ANEXO A – CHILD PERCEPTION QUESTIONNAIRE (CPQ11-14)

CPQ-11-14

Perguntas globais:
Você diria que a saúde de seus dentes, lábios, maxilares e boca é:
( ) Excelente ( ) Boa ( ) Regular ( ) Ruim ( ) Péssima

Até que ponto a condição dos seus dentes, lábios, maxilares e boca afetam sua vida em geral?
(.) De jeito nenhum (.) Um pouco ( ) Moderadamente ( ) Bastante ( ) Muitíssimo

PERGUNTAS SOBRE PROBLEMAS ORAIS

Nos últimos 3 meses, com que frequência você teve?

	nunca	1 ou 2 vezes	algumas vezes	frequentemente	todos os dias ou quase todos
1. Dor nos seus dentes, lábios, maxilares ou boca?					
2. Feridas na boca?					
3. Mau hálito?					
4. Restos de alimentos presos dentre ou entre os seus dentes?					

Isso aconteceu por causa de seus dentes, lábios, maxilares e boca?

Nos últimos 3 meses, com que frequência você:

	nunca	1 ou 2 vezes	algumas vezes	frequentemente	todos os dias ou quase todos
5. Demorou mais que os outros para terminar sua refeição?					

Nos últimos 3 meses, por causa dos seus dentes, lábios, boca e maxilares, com que frequência você teve?

	nunca	1 ou 2 vezes	algumas vezes	frequentemente	todos os dias ou quase todos
6.Dificuldade para morder ou mastigar alimentos como maças, espiga de milho ou carne?					
7. Dificuldades para dizer algumas palavras?					
8. Dificuldades para beber ou comer alimentos quentes ou frios?					

PERGUNTAS SOBRE SENTIMENTOS E/OU SENSAÇÕES

Você já experimentou esse sentimento por causa de seus dentes, lábios, maxilares ou boca? Se você se sentiu desta maneira por outro motivo, responda "nunca".

	nunca	1 ou 2 vezes	algumas vezes	frequentemente	todos os dias ou quase todos
9. Ficou irritado (a) ou frustrado (a)?					
10.Ficou tímido (a), constrangido (a) ou com vergonha?					
11. Ficou chateado?					
12.Ficou preocupado com o que as pessoas pensam sobre seus dentes, lábios, boca ou maxilares?					

PERGUNTAS SOBRE SUAS ATIVIDADES EM SEU TEMPO LIVRE E NA COMPANHIA DE OUTRAS PESSOAS

Você já teve estas experiências por causa dos seus dentes, lábios, maxilares ou boca? Se for por outro motivo, responda "nunca".
Nos últimos 3 meses, com que frequência você:

	nunca	1 ou 2 vezes	algumas vezes	frequentemente	todos os dias ou quase todos
13. Evitou sorrir ou dar risada quando está com outras crianças?					
14. Discutiu com outras crianças ou pessoas de sua família?					
15. Outras crianças lhe aborreceram ou lhe chamaram por apelidos?					
16.Outras crianças fizeram perguntas sobre seus dentes, lábios, maxilares e boca?					

ANEXO B – ANTONOVSK'S 13-ITEM QUESTIONNAIRE (SOC-13)

Senso de Coerência (SOC- 13)

INSTRUÇÕES
Aqui estão 13 perguntas sobre vários aspectos da sua vida. Cada pergunta tem cinco respostas possíveis. Escolha a opção que melhor expresse a sua maneira de pensar e sentir em relação ao que está sendo falado.
Dê apenas uma única resposta em cada pergunta. Não existem respostas certas ou erradas.

		Um enorme sofrimento e aborrecimento	Um sofrimento e aborrecimento	Nem aborrecimento nem satisfação	Um prazer e satisfação	Um enorme prazer e satisfação
01	Aquilo que você faz diariamente é:					

		Sem nenhum objetivo	Com poucos objetivos	Com alguns objetivos	Com muitos objetivos	Repleta de objetivos
02	Até hoje a sua vida tem sido:					

		Nunca	Poucas vezes	Algumas vezes	Muitas vezes	Sempre
03	Você tem interesse pelo que se passa ao seu redor?					
04	Você acha que você é tratado(a) com injustiça?					
05	Você tem ideias e sentimentos confusos?					
06	Você acha que as coisas que você faz na sua vida têm pouco sentido?					
07	Já lhe aconteceu ter ficado desapontada com pessoas em quem você confiava?					
08	Você tem sentimentos que gostaria de não ter?					
09	Você tem dúvida se pode controlar seus sentimentos?					
10	Já lhe aconteceu de ficar surpreendida com o comportamento de pessoas que você achava que conhecia bem?					
11	Em algumas situações, as pessoas sentem-se fracassadas. Você já se sentiu fracassado(a)?					
12	Você sente que está numa situação pouco comum, e sem saber o que fazer?					

		Totalmente errada	Errada	Nem correta e nem errada	Correta	Totalmente correta
13	Às vezes acontecem coisas na vida da gente que depois achamos que não demos a devida importância. Quando alguma coisa acontece na sua vida, você acaba achando que deu a importância:					

ANEXO C – CARTA DE APROVAÇÃO DO COMITÊ DE ÉTICA EM PESQUISA

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos

Pesquisador: Thiago Machado Ardenghi

Área Temática:

Versão: 2

CAAE: 11765419.1.0000.5346

Instituição Proponente: Departamento de Estomatologia

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 3.425.591

Apresentação do Projeto:

O objetivo deste estudo é explorar as inter-relações longitudinais entre fatores sociais individuais e comunitários no senso de coerência e nas condições de saúde bucal de escolares no município de Santa Maria, RS, Brasil. Esta pesquisa trata-se de uma coorte iniciado no ano de 2010 com 639 pré-escolares (1-5 anos) no qual se propõe uma quarta etapa de avaliação dos indivíduos que compõe a amostra, totalizando 10 anos de acompanhamento. As questões referentes aos fatores demográficos, condições socioeconômicas e fatores comportamentais serão obtidas através de um questionário semiestruturado aplicado aos pais/responsáveis dos escolares. Além disso, os escolares responderão questões referentes ao senso de coerência e outros medidas subjetivas. Os dados a respeito das condições bucais serão obtidos através de exames clínicos realizados por examinadores previamente treinados e calibrados. As variáveis clínicas consideradas serão cárie, traumatismo dentário, sangramento gengival, presença de placa visível, maloclusão e dor dentária. Modelagem de equações estruturais (MEE) será utilizada para testar as inter-relações entre o capital social individual e comunitário (como principais preditores) com SDC e resultados de saúde bucal (desfechos).

Objetivo da Pesquisa:

Explorar as inter-relações longitudinais entre fatores sociais individuais e comunitários no senso

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar
Bairro: Camobi **CEP:** 97.105-970
UF: RS **Município:** SANTA MARIA
Telefone: (55)3220-9362 **E-mail:** cep.ufsm@gmail.com

de coerência e nas condições de saúde bucal de escolares no município de Santa Maria, RS, Brasil.

Avaliação dos Riscos e Benefícios:

Considerando-se as características do projeto, a descrição de riscos e benefícios apresentada pode ser considerada suficiente.

Comentários e Considerações sobre a Pesquisa:

.

Considerações sobre os Termos de apresentação obrigatória:

Os termos de apresentação obrigatória podem ser considerados suficientes.

Recomendações:

Veja no site do CEP - http://w3.ufsm.br/nucleodecomites/index.php/cep - na aba "orientações gerais", modelos e orientações para apresentação dos documentos. ACOMPANHE AS ORIENTAÇÕES DISPONÍVEIS, EVITE PENDÊNCIAS E AGILIZE A TRAMITAÇÃO DO SEU PROJETO.

Conclusões ou Pendências e Lista de Inadequações:

.

Considerações Finais a critério do CEP:

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1331113.pdf	27/06/2019 15:35:37		Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TermoAssentimento_mod.pdf	27/06/2019 15:32:32	Thiago Machado Ardenghi	Aceito
Outros	Carta_ao_CEP.pdf	27/06/2019 15:29:54	Thiago Machado Ardenghi	Aceito
Outros	Autorizacao_munic.pdf	27/06/2019 15:29:33	Thiago Machado Ardenghi	Aceito

Outros	autorizacao_estad.pdf	27/06/2019 15:28:57	Thiago Machado Ardenghi	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE_mod.pdf	27/06/2019 15:25:36	Thiago Machado Ardenghi	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TermoConfidencialidadenovo.pdf	22/05/2019 12:11:40	Thiago Machado Ardenghi	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TermoConfidencialidade.pdf	12/04/2019 12:14:19	Thiago Machado Ardenghi	Aceito
Cronograma	cronograma.pdf	10/04/2019 09:49:59	Thiago Machado Ardenghi	Aceito
Declaração de Instituição e Infraestrutura	Autorizacao.pdf	10/04/2019 09:45:32	Thiago Machado Ardenghi	Aceito
Projeto Detalhado / Brochura Investigador	projeto.pdf	10/04/2019 09:45:02	Thiago Machado Ardenghi	Aceito
Folha de Rosto	folharosto.pdf	10/04/2019 09:44:43	Thiago Machado Ardenghi	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

SANTA MARIA, 28 de Junho de 2019

Assinado por:
CLAUDEMIR DE QUADROS
(Coordenador(a))

ANEXO D – AUTORIZAÇÃO DA 8ª COORDENADORIA REGIONAL DE EDUCAÇÃO

UNIVERSIDADE FEDERAL DE SANTA MARIA
PROGRAMA DE PÓS GRADUAÇÃO EM CIÊNCIAS ODONTOLÓGICAS

PPGCO

Termo de Autorização da Instituição

Eu, abaixo assinado, responsável pela 8ª Coordenadoria Regional de Educação, autorizo a realização do estudo "Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos" a ser conduzido pelos pesquisadores abaixo relacionados. Fui informado pelos responsáveis do estudo sobre as características e objetivos da pesquisa, bem como das atividades que serão realizadas na instituição a qual represento. Serão as seguintes atividades:

- A condição de saúde bucal dos alunos de 10 a 14 anos encontrados na escola será avaliada através de exame clínico bucal para coleta do índice ICDAS (Índice para avaliação de dentes cariados) segundo os códigos e critérios recomendados pela Organização Mundial de Saúde, além do Índice de Placa Dentária, Índice de Sangramento Gengival e Índice de traumatismo. O exame será feito sob luz natural indireta, com auxílio de espelhos bucais planos, sondas CPI e utilização de gaze para secar as superfícies dentárias.

- As avaliações serão realizadas pelos pesquisadores Jessica Klöckner Knorst, Bruna Brondani, Gabriela Bohrer Bolsson e Gabriele Rissotto Menegazzo, sob supervisão do professor pesquisador responsável pelo projeto, Thiago Machado Ardenghi, na própria escola, em uma sala específica designada para este fim. As anotações dos valores obtidos serão feitas por uma auxiliar, em uma ficha clínica especialmente confeccionada para a pesquisa e baseada nos critérios da OMS. Os examinadores passaram por prévia calibração antes dos exames clínicos para garantir a reprodutibilidade dos dados obtidos. Também será aplicado um questionário às crianças o qual avaliará sua qualidade de vida relacionada à saúde bucal e o senso de coerência.

- Além disso, um questionário autoaplicável será respondido pelos pais ou responsáveis e contará com questões sobre dados gerais da criança, nível de escolaridade, condições socioeconômicas, higiene bucal, capital social e procura e frequência de visitas odontológicas.

Declaro ainda conhecer e cumprir as Resoluções Éticas Brasileiras, em especial a Resolução CNS 466/12. Esta instituição está ciente de suas corresponsabilidades como instituição coparticipante do presente projeto de pesquisa e de seu compromisso no resguardo da segurança e bem-estar dos

participantes de pesquisa nela recrutados, possibilitando condições mínimas necessárias para a garantia de tal segurança e bem-estar.

Santa Maria, 26 de JUNHO de 2019.

JOSÉ LUIS VIERA EGGRES
Coordenador Regional de Educação - 8ª CRE
ID: 2389533/02
Boletim 130/2017 - D.O. 07/06/2017

Coordenador da 8ª CRE

Lista Nominal de Pesquisadores:

Professor Dr. Thiago Machado Ardenghi

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Jessica Klöckner Knorst;

Mestranda do Programa de Pós Graduação em Ciências Odontológicas Bruna Brondani;

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Gabriela Bohrer Bolsson;

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Gabriele Rissotto Menegazzo;

ANEXO E – AUTORIZAÇÃO DA SECRETARIA MUNICIPAL DA EDUCAÇÃO

UNIVERSIDADE FEDERAL DE SANTA MARIA
PROGRAMA DE PÓS GRADUAÇÃO EM CIÊNCIAS ODONTOLÓGICAS

PPGCO

Termo de Autorização da Instituição

Eu, abaixo assinado, responsável pela Secretaria Municipal da Educação do município de Santa Maria, autorizo a realização do estudo "Influência do capital social no desenvolvimento do senso de coerência e nas condições bucais de escolares: uma coorte de 10 anos" a ser conduzido pelos pesquisadores abaixo relacionados. Fui informado pelos responsáveis do estudo sobre as características e objetivos da pesquisa, bem como das atividades que serão realizadas na instituição a qual represento. Serão as seguintes atividades;

- A condição de saúde bucal dos alunos de 10 a 14 anos encontrados na escola será avaliada através de exame clínico bucal para coleta do índice ICDAS (Índice para avaliação de dentes cariados) segundo os códigos e critérios recomendados pela Organização Mundial de Saúde, além do Índice de Placa Dentária, Índice de Sangramento Gengival e Índice de traumatismo. O exame será feito sob luz natural indireta, com auxílio de espelhos bucais planos, sondas CPI e utilização de gaze para secar as superfícies dentárias.

- As avaliações serão realizadas pelos pesquisadores Jessica Klöckner Knorst, Bruna Brondani, Gabriela Bohrer Bolsson e Gabriele Rissotto Menegazzo, sob supervisão do professor pesquisador responsável pelo projeto, Thiago Machado Ardenghi, na própria escola, em uma sala específica designada para este fim. As anotações dos valores obtidos serão feitas por uma auxiliar, em uma ficha clínica especialmente confeccionada para a pesquisa e baseada nos critérios da OMS. Os examinadores passaram por prévia calibração antes dos exames clínicos para garantir a reprodutibilidade dos dados obtidos. Também será aplicado um questionário às crianças o qual avaliará sua qualidade de vida relacionada à saúde bucal e o senso de coerência.

- Além disso, um questionário autoaplicável será respondido pelos pais ou responsáveis e contará com questões sobre dados gerais da criança, nível de escolaridade, condições socioeconômicas, higiene bucal, capital social e procura e frequência de visitas odontológicas.

Declaro ainda conhecer e cumprir as Resoluções Éticas Brasileiras, em especial a Resolução CNS 466/12. Esta instituição está ciente de suas corresponsabilidades como instituição coparticipante do presente projeto de pesquisa e de seu compromisso no resguardo da segurança e bem-estar dos

participantes de pesquisa nela recrutados, possibilitando condições mínimas necessárias para a garantia de tal segurança e bem-estar.

Santa Maria, 26 de Junho de 2019.

Coordenadora da Secretária Municipal da Educação

Gisele Bauer Mahmud
Superint. Pedagógica
SMED - Portaria Nº 04/2019

Lista Nominal de Pesquisadores:

Professor Dr. Thiago Machado Ardenghi

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Jessica Klöckner Knorst;

Mestranda do Programa de Pós Graduação em Ciências Odontológicas Bruna Brondani;

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Gabriela Bohrer Bolsson;

Doutoranda do Programa de Pós Graduação em Ciências Odontológicas Gabriele Rissotto Menegazzo;

ANEXO F – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY

Author Guidelines

Community Dentistry & Oral Epidemiology now offers Free Format submission for a simplified and streamlined submission process; More details here

Content of Author Guidelines: 1. General, 2. Ethical Guidelines, 3. Submission of Manuscripts, 4. Manuscript Format and Structure, 5. After Acceptance

Useful Websites: **Submission Site**, **Articles published in *Community Dentistry and Oral Epidemiology***, **Author Services**, **Wiley Blackwell's Ethical Guidelines**, **Guidelines for Figures**

1. GENERAL

The aim of *Community Dentistry and Oral Epidemiology* is to serve as a forum for scientifically based information in community dentistry, with the intention of continually expanding the knowledge base in the field. The scope is therefore broad, ranging from original studies in epidemiology, behavioural sciences related to dentistry, and health services research, through to methodological reports in program planning, implementation and evaluation. Reports dealing with people of any age group are welcome.

The journal encourages manuscripts which present methodologically detailed scientific research findings from original data collection or analysis of existing databases. Preference is given to new findings. Confirmation of previous findings can be of value, but the journal seeks to avoid needless repetition. It also encourages thoughtful, provocative commentaries on subjects ranging from research methods to public policies. Purely descriptive reports are not encouraged, and neither are behavioural science reports with only marginal application to dentistry.

Knowledge in any field advances only when research findings and policies are held up to critical scrutiny. To be consistent with that view, the journal encourages scientific debate on a wide range of topics. Responses to research findings and views expressed in the journal are always welcome, whether in the form of a manuscript or a commentary. Prompt publication will be sought for these submissions. Book reviews and short reports from international conferences are also welcome, and publication of conference proceedings can be arranged with the publisher.

Please read the instructions below carefully for details on the submission of manuscripts, and the journal's requirements and standards, as well as information on the procedure after acceptance of a manuscript for publication in *Community Dentistry and Oral Epidemiology*. Authors are encouraged to visit **Wiley Blackwell Author Services** for further information on the preparation and submission of articles and figures.

2. GUIDELINES FOR RESEARCH REPORTING

Community Dentistry and Oral Epidemiology adheres to the ethical guidelines below for publication and research.

2.1. Authorship and Acknowledgements

Authorship: Authors submitting a manuscript do so on the understanding that the manuscript has been read and approved by all authors, and that all authors agree to the submission of the manuscript to the Journal.

Community Dentistry and Oral Epidemiology adheres to the definition of authorship set up by the International Committee of Medical Journal Editors (ICMJE). According to the ICMJE criteria, authorship should be based on (1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content and (3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3.

It is a requirement that all authors have been credited as appropriate upon submission of the manuscript. Contributors who do not qualify as authors should instead be mentioned under Acknowledgments.

Acknowledgements: Under *acknowledgements*, please specify contributors to the article other than the authors accredited, along with all sources of financial support for the research.

2.2. Ethical Approvals
In all reports of original studies with humans, authors should specifically state the nature of the ethical review and clearance for the study protocol. Informed consent must be obtained from human participants in research studies. Some reports, such as those dealing with institutionalized children or mentally disabled persons, may need additional details of ethical clearance.

Research participants: research involving human participants will be published only if such research has been conducted in full accordance with ethical principles, including the World Medical Association **Declaration of Helsinki** (version 2008) and the additional requirements (if any) of the country where the research has been carried out.

Manuscripts must be accompanied by a statement that the research was undertaken with the understanding and written consent of each participant and according to the above mentioned principles.

All studies should include an explicit statement in the Methods section identifying the review and ethics committee approval for each study, if applicable. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used. Take care to use the term "participant" instead of "subject" when reporting on your study.

Ethics of investigation: Manuscripts not in agreement with the guidelines of the Helsinki Declaration (as revised in 1975) will not be accepted for publication.

Animal Studies: If experimental animals are used, the methods section must clearly indicate that adequate measures were taken to minimize pain or discomfort. Experiments should be carried out in accordance with the Guidelines laid down by the National Institute of Health (NIH) in the USA in respect of the care and use of animals for experimental procedures or with the European Communities Council Directive of 24 November 1986 (86/609/EEC) and in accordance with local laws and regulations.

2.3. Clinical Trials
Clinical trials should be reported using the CONSORT guidelines available at **http://www.consort-statement.org**. A **CONSORT checklist** should also be included in the submission material.

Community Dentistry and Oral Epidemiology encourages authors submitting manuscripts reporting from a clinical trial to register the trials in any of the following free, public clinical trials registries: **www.clinicaltrials.gov**, **http://clinicaltrials.ifpma.org/clinicaltrials**, **http://isrctn.org/**. The clinical trial registration number and name of the trial register will then be published with the manuscript.

2.4. Observational and Other Studies
Reports on observational studies such as cohort, case-control and cross-sectional studies should be consistent with guidelines such as STROBE. Meta-analysis for systematic reviews should be reported consistent with guidelines such as QUOROM or MOOSE. These guidelines can be accessed at **www.equator-network.org**. Authors of analytical studies are strongly encouraged to submit a Directed Acyclic Graph as a supplementary file for the reviewers and editors. This serves to outline the rationale for their modelling approach and to ensure that authors consider carefully the analyses that they conduct.

Studies with a health economics focus should be consistent with the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement and the CHEERS checklist; see the article at the following link: **https://www.bmj.com/content/346/bmj.f1049**.

2.5. Appeal of Decision
The decision on a manuscript is final and cannot be appealed.

2.6. Permissions
If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the primary author's responsibility to obtain these in writing and provide copies to the Publishers.

Photographs of People
Community Dentistry and Oral Epidemiology follows current HIPAA guidelines for the protection of

patient/participant privacy. If an individual pictured in a digital image or photograph can be identified, his or her permission is required to publish the image. The corresponding author may submit a letter signed by the patient authorizing the *Community Dentistry and Oral Epidemiology* to publish the image/photo. Alternatively, a form provided by *Community Dentistry and Oral Epidemiology* (available by clicking the "Instructions and Forms" link in Manuscript central) may be downloaded for your use. You can also download the form **here**. This approval must be received by the Editorial Office prior to final acceptance of the manuscript for publication. Otherwise, the image/photo must be altered such that the individual cannot be identified (black bars over eyes, etc.).

2.7. Copyright Assignment
If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to log into Author Services, where, via the Wiley Author Licensing Service (WALS), they will be able to complete the licence agreement on behalf of all authors on the paper.

For authors signing the copyright transfer agreement
If the Open Access option is not selected, the corresponding author will be presented with the copyright transfer agreement (CTA) to sign. The terms and conditions of the CTA can be previewed in the samples associated with the Copyright FAQs below:

CTA Terms and Conditions **http://authorservices.wiley.com/bauthor/faqs_copyright.asp**

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To preview the terms and conditions of these open access agreements, please visit the Copyright FAQs hosted on Wiley Author Services **http://authorservices.wiley.com/bauthor/faqs_copyright.asp** and visit **http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright--License.html**.

If you select the Open Access option and your research is funded by The Wellcome Trust and members of the Research Councils UK (RCUK) or the Austrian Science Fund (FWF), you will be given the opportunity to publish your article under a CC-BY license supporting you in complying with your Funder requirements. For more information on this policy and the Journal's compliant self-archiving policy, please visit: **http://www.wiley.com/go/funderstatement**.

3. SUBMISSION OF MANUSCRIPTS

New submissions should be made via the Research Exchange submission portal: **https://wiley.atyponrex.com/journal/CDOE**. Should your manuscript proceed to the revision stage, you will be directed to make your revisions via the same submission portal. You may check the status of your submission at anytime by logging on to submission.wiley.com and clicking the "My Submissions" button. For technical help with the submission system, please review our **FAQs** or contact **submissionhelp@wiley.com**.

Community Dentistry and Oral Epidemiology requires the submitting/corresponding author (only) to provide an ORCID iD when submitting their manuscript. If the author does not have an ORCID iD, an easy-to-use application to obtain one is available through the journal's ScholarOne system. Complete instructions for submitting a manuscript are available online and below. Further assistance can be obtained from the Managing Editor, Michelle Martire: **cdoejournal@wiley.com**

Editorial Office:

Professor Sarah Baker
The University of Sheffield
School of Clinical Dentistry
19 Claremont Crescent
Sheffield
S10 2TA
UK
E-mail: **s.r.baker@sheffield.ac.uk**

The Managing Editor is Michelle Martire: **cdoejournal@wiley.com**

Data Sharing and Data Availability

Community Dentistry and Oral Epidemiology expects that data supporting the results in the paper will be archived in an appropriate public repository. Authors are required to provide a **data availability statement** to describe the availability or the absence of shared data. When data have been shared, authors are required to include in their data availability statement a link to the repository they have used, and to cite the data they have shared. Whenever possible the scripts and other artefacts used to generate the analyses presented in the paper should also be publicly archived. If sharing data compromises ethical standards or legal requirements, then authors are not expected to share it.

Article Preparation Support

Wiley Editing Services offers expert help with English Language Editing, as well as translation, manuscript formatting, figure illustration, figure formatting, and graphical abstract design – so you can submit your manuscript with confidence.

Also, check out our resources for **Preparing Your Article** for general guidance about writing and preparing your manuscript.

3.1. Getting Started

By submitting a manuscript to or reviewing for this publication, your name, email address, and affiliation, and other contact details the publication might require, will be used for the regular operations of the publication, including, when necessary, sharing with the publisher (Wiley) and partners for production and publication. The publication and the publisher recognize the importance of protecting the personal information collected from users in the operation of these services, and have practices in place to ensure that steps are taken to maintain the security, integrity, and privacy of the personal data collected and processed. You can learn more at **https://authorservices.wiley.com/statements/data-protection-policy.html**

3.2. Manuscript Files Accepted

Manuscripts should be uploaded as Word (.doc or .docx) or Rich Text Format (.rtf) files (not write-protected), along with separate Figure files. For the latter, GIF, JPEG, PICT or Bitmap files are acceptable for submission, but only high-resolution TIF or EPS files are suitable for printing. Tables should be done in Word rather than in Excel. The files will be automatically converted to HTML and a PDF document on upload, and those will be used for the review process. The text file must contain the entire manuscript, including the title page, abstract, text, references, tables, and figure legends, but no embedded figures. Figure tags should be included in the file. Manuscripts should be formatted as described in the Author Guidelines below.

3.3. Suggest Two Reviewers

Community Dentistry and Oral Epidemiology attempts to keep the review process as short as possible to enable rapid publication of new scientific data. In order to facilitate this process, please suggest the names and current email addresses of two potential international reviewers whom you consider capable of reviewing your manuscript. Whether these are used is up to the Editor, but it is helpful to have the suggestions.

3.4. Suspension of Submission Mid-way in the Submission Process

You may suspend a submission at any phase before clicking the 'Submit' button and save it to submit later. The manuscript can then be located under 'Unsubmitted Manuscripts' and you can click on 'Continue Submission' to continue your submission when you choose to.

3.5. E-mail Confirmation of Submission

After submission, you will receive an email to confirm receipt of your manuscript. If you do not receive the confirmation email within 10 days, please check your email address carefully in the system. If the email address is correct, please contact your IT department. The error may be caused by some sort of spam filtering on your email server. Also, the emails should get through to you if your IT department adds our email server (uranus.scholarone.com) to their whitelist.

3.6. Review Procedures

All manuscripts (except some commentaries and conference proceedings) are submitted to an initial review by the Editor or Associate Editors. Manuscripts which are not considered relevant to oral epidemiology or the practice of community dentistry or are not of interest to the readership of *Community Dentistry and Oral Epidemiology* will be rejected without review. Manuscripts presenting innovative, hypothesis-driven research

with methodologically detailed scientific findings are favoured to move forward to peer review. All manuscripts accepted for peer review will be submitted to at least 2 reviewers for peer review, and comments from the reviewers and the editor will be returned to the corresponding author.

3.7. Manuscript Status
You can access ScholarOne Manuscripts (formerly known as Manuscript Central) any time to check your 'Author Centre' for the status of your manuscript. The Journal will inform you by e-mail once a decision has been made.

3.8. Submission of Revised Manuscripts
Revised manuscripts must be uploaded within two or three months of authors being notified of a Minor or Major revision decision respectively. Locate your manuscript under 'Manuscripts with Decisions' and click on 'Submit a Revision' to submit your revised manuscript. Please remember to delete any previously-uploaded files when you upload your revised manuscript. Revised manuscripts must show changes to the text in either a coloured font or highlighted text. Do NOT use track changes for this. Prepare and submit a separate "Response to reviewers" document, in which you address EACH of the points raised by the reviewers.

3.9. Conflict of Interest
Community Dentistry & Oral Epidemiology requires that sources of institutional, private and corporate financial support for the work within the manuscript must be fully acknowledged, and any potential grant holders should be listed. Acknowledgements should be brief and should include information concerning conflict of interest and sources of funding. It should not include thanks to anonymous referees and editors.

3.10. Editorial Board Submissions
Manuscripts authored or co-authored by the Editor-in-Chief or by members of the Editorial Board are evaluated using the same criteria determined for all other submitted manuscripts. The process is handled confidentially and measures are taken to avoid real or reasonably perceived conflicts of interest.

4. MANUSCRIPT FORMAT AND STRUCTURE

Community Dentistry & Oral Epidemiology now offers Free Format submission for a simplified and streamlined submission process.

Before you submit, you will need:

- Your manuscript: this should be an editable file including text, figures, and tables, or separate files – whichever you prefer. All required sections should be contained in your manuscript, including abstract, introduction, methods, results, and conclusions. Figures and tables should have legends. Figures should be uploaded in the highest resolution possible. References may be submitted in any style or format, as long as it is consistent throughout the manuscript. Supporting information should be submitted in separate files. If the manuscript, figures or tables are difficult for you to read, they will also be difficult for the editors and reviewers, and the editorial office will send it back to you for revision. Your manuscript may also be sent back to you for revision if the quality of English language is poor.
- An ORCID ID, freely available at https://orcid.org. *(Why is this important? Your article, if accepted and published, will be attached to your ORCID profile. Institutions and funders are increasingly requiring authors to have ORCID IDs.)*
- The title page of the manuscript, including:
    - Your co-author details, including affiliation and email address. *(Why is this important? We need to keep all co-authors informed of the outcome of the peer review process.)*
    - Statements relating to our ethics and integrity policies, which may include any of the following *(Why are these important? We need to uphold rigorous ethical standards for the research we consider for publication):*
        - data availability statement
        - funding statement
        - conflict of interest disclosure
        - ethics approval statement
        - patient consent statement
        - permission to reproduce material from other sources
        - clinical trial registration

If you are invited to revise your manuscript after peer review, the journal will also request the revised manuscript to be formatted according to journal requirements as described below.

Main Text File
Manuscripts can be uploaded either as a single document (containing the main text, tables and figures), or with figures and tables provided as separate files. Should your manuscript reach revision stage, figures and tables must be provided as separate files. The main manuscript file can be submitted in Microsoft Word (.doc or .docx) format.

Your main document file should include:

- A short informative title containing the major key words. The title should not contain abbreviations
- The full names of the authors with institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted
- Acknowledgments
- Abstract
- Up to seven keywords
- Main body
- References
- Tables (each table complete with title and footnotes)
- Figures: Figure legends must be added beneath each individual image during upload AND as a complete list in the text

4.1. Word Limit and Page Charges
Articles should be limited to 3,700 words (including references) and 6 Tables or Figures; alternatively, 4,000 words and 5 Tables or Figures may be used. This equates to seven published pages, **and authors are strongly encouraged to stay within those limits.** The Methods and Results sections are usually where the word count can "blow out", and authors are encouraged to consider submitting heavily detailed material for inclusion in a separate online Appendix to their article (at no cost). **Articles exceeding seven published pages are subject to a charge of USD 300 per additional page. One published page amounts approximately to 5,500 characters (including spaces) of text but does not include Figures and Tables.**

4.2. Format Language
All submissions must be in English; both British and American spelling conventions are acceptable. Authors for whom English is a second language must have their manuscript professionally edited by an English speaking person before submission to make sure the English is of high quality. It is preferred that the manuscript is professionally edited. A list of independent suppliers of editing services can be found at **http://wileyeditingservices.com/en/**. All services must be paid for and arranged by the author, and use of one of these services does not guarantee acceptance or preference for publication.

Font: All submissions must be 1.5 spaced using a standard 12-point font size, and preferably in the Times Roman font.

Abbreviations, Symbols and Nomenclature: Authors can consult the following source: CBE Style Manual Committee. Scientific style and format: the CBE manual for authors, editors, and publishers. 6th ed. Cambridge: Cambridge University Press, 1994

4.3. Structure
All manuscripts submitted to *Community Dentistry and Oral Epidemiology* should follow the structure guidelines below.

Title Page: the names and institutional affiliations of all authors of the manuscript should be included.

Abstract: All manuscripts submitted to *Community Dentistry and Oral Epidemiology* should use a structured abstract under the headings: Objectives – Methods – Results – Conclusions.

Main Text of Original Articles should include Introduction, Methods, Results and Discussion. Subheadings are not encouraged.

Introduction: this should be focused, outlining the historical or logical origins of the study and not summarise the findings; exhaustive literature reviews are not appropriate. It should close with an explicit statement of the specific aims of the investigation.

Methods must contain sufficient detail such that, in combination with the references cited, all studies reported can be fully reproduced. As a condition of publication, authors are required to make materials and methods used freely available to other academic researchers for their own use.

Results should not focus overly on P values – we concur with recent calls for less emphasis on statistical significance (see Amrhein et al, Nature 2019; 567: 305-307). In the Results section, have one paragraph of text per Table, and do not repeat Table data in that Results text; instead, draw the reader's attention to the highlights/important parts of the Table. Avoid "compared to" - use 'than' instead.

Discussion: See Docherty and Smith, BMJ 1999; 318: 1224-5 for how to structure a Discussion section. That structure is encouraged. The section should end with a brief conclusion and a comment on the potential clinical program or policy relevance of the findings. Statements and interpretation of the data should be appropriately supported by original references. In the Discussion and conclusion, use the term 'findings' rather than 'results'.

4.4. References

Authors are required to cite all necessary references for the research background, methods and issues discussed. Primary sources should be cited. Relevant references published in CDOE are expected to be among the cited literature.

The list of references begins on a fresh page in the manuscript. All references should be numbered consecutively in order of appearance and should be as complete as possible. In text citations should cite references in consecutive order using Arabic superscript numerals. Sample references follow:

Journal article:

1. King VM, Armstrong DM, Apps R, Trott JR. Numerical aspects of pontine, lateral reticular, and inferior olivary projections to two paravermal cortical zones of the cat cerebellum. *J Comp Neurol* 1998;390:537-551.

Book:

2. Voet D, Voet JG. *Biochemistry*. New York: John Wiley & Sons; 1990. 1223 p.

Please note that journal title abbreviations should conform to the practices of Chemical Abstracts.

For more information about AMA reference style - **AMA Manual of Style**

4.5. Tables, Figures and Figure Legends

Tables are part of the text and should be included, one per page, after the References. Please see our **Guide to Tables and Figures** for guidance on how to lay these out. All graphs, drawings, and photographs are considered figures and should be sequentially numbered with Arabic numerals. Each figure must be on a separate page and each must have a caption. All captions, with necessary references, should be typed together on a separate page and numbered clearly (Fig.1, Fig. 2, etc.).

Preparation of Electronic Figures for Publication: Although low-quality images are adequate for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit EPS (lineart) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented programmes. Scans (TIFF only) should have a resolution of 300 dpi (halftone) or 600 to 1200 dpi (line drawings) in relation to the reproduction size (see below). EPS files should be saved with fonts embedded (and with a TIFF preview if possible). For scanned images, the scanning resolution (at final image size) should be as follows to ensure good reproduction: line art: >600 dpi; half-tones (including gel photographs): >300 dpi; figures containing both halftone and line images: >600 dpi.

Further information can be obtained at Wiley Blackwell's guidelines for figures: **http://authorservices.wiley.com/bauthor/illustration.asp**.

Check your electronic artwork before submitting it: **http://authorservices.wiley.com/bauthor/eachecklist.asp**

Permissions: If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the corresponding author's responsibility to obtain these in writing and provide copies to the Publishers.

Figure Legends: All captions, with necessary references, should be typed together on a separate page and numbered clearly (Fig.1, Fig. 2, etc.).

Special issues: Larger papers, monographs, and conference proceedings may be published as special issues of the journal. The full cost of these extra issues must be paid by the authors. Further information can be obtained from the editor or publisher.

5. AFTER ACCEPTANCE

Upon acceptance of a manuscript for publication, the manuscript will be forwarded to the Production Editor, who is responsible for the production of the journal.

5.1. Proof Corrections

The corresponding author will receive an email alert containing a link to a web site. A working email address must therefore be provided for the corresponding author. The proof can be downloaded as a PDF (portable document format) file from this site.

Acrobat Reader will be required in order to read this file. This software can be downloaded (free of charge) from the following Web site: **www.adobe.com/products/acrobat/readstep2.html**. This will enable the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof. Hard copy proofs will be posted if no e- mail address is available; in your absence, please arrange for a colleague to access your e-mail to retrieve the proofs. Proofs must be returned within three days of receipt.

Since changes to proofs are costly, we ask that you only correct typesetting errors. Excessive changes made by the author in the proofs, excluding typesetting errors, will be charged separately. Other than in exceptional circumstances, all illustrations are retained by the publisher. Please note that the author is responsible for all statements made in the work, including changes made by the copy editor.

5.2. Early View (Publication Prior to Print)

Community Dentistry and Oral Epidemiology is covered by Wiley Blackwell's Early View service. Early View articles are complete full-text articles published online in advance of their publication in a printed issue. They have been fully reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after online publication. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the traditional way. They are therefore given a Digital Object Identifier (DOI), which allows the article to be cited and tracked before it is allocated to an issue. After print publication, the DOI remains valid and can continue to be used to cite and access the article.

5.3. Author Services

Online production tracking is available for your article through Wiley's Author Services. Please see: **http://authorservices.wiley.com/bauthor/**

5.4. Article Promotion Support

Wiley Editing Services offers professional video, design, and writing services to create shareable video abstracts, infographics, conference posters, lay summaries, and research news stories for your research – so you can help your research get the attention it deserves.

5.5. Cover Image Submissions

This journal accepts artwork submissions for Cover Images. This is an optional service you can use to help increase article exposure and showcase your research. For more information, including artwork guidelines, pricing, and submission details, please visit the **Journal Cover Image** page.

5.6. Wiley's Author Name Change Policy

In cases where authors wish to change their name following publication, Wiley will update and republish the paper and redeliver the updated metadata to indexing services. Our editorial and production teams will use discretion in recognizing that name changes may be of a sensitive and private nature for various reasons including (but not limited to) alignment with gender identity, or as a result of marriage, divorce, or religious conversion. Accordingly, to protect the author's privacy, we will not publish a correction notice to the paper, and we will not notify co-authors of the change. Authors should contact the journal's Editorial Office with their name change request.

ANEXO G – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO JOURNAL OF DENTAL RESEARCH

The Journal of Dental Research (JDR) adheres to the CSE (8th Edition) editorial style. All submitted manuscripts should be formatted in this style

The Journal of Dental Research (JDR) is a peer-reviewed scientific journal dedicated to the dissemination of new knowledge and information on all science relevant to dentistry and to the oral cavity and associated structures in health and disease. The Journal of Dental Research's primary readership consists of oral, dental and craniofacial researchers, clinical scientists, hard- tissue scientists, dentists, dental educators, and oral and dental policy-makers. The Journal is published monthly, allowing for frequent dissemination of its leading content. The Journal of Dental Research also offers OnlineFirst, by which forthcoming articles are published online before they are scheduled to appear in print.
Authors of all types of articles should be aware of the following guidelines when submitting to JDR.

ONLINE SUBMISSION

Submissions to the Journal of Dental Research are only accepted for consideration via the SAGETrack online manuscript submission site at http://mc.manuscriptcentral.com/jdr. Authors who do not have an active account within the system are required to create a new account by clicking, "Create Account," on the log-in page. The system will prompt the authors through a step by step process to create their account. Once created authors can submit their manuscripts by entering their "Author Center" and clicking the button by "Click Here to Submit a New Manuscript."

If any difficulty is encountered at any time during the account creation or submission process, authors are encouraged to contact the Journal of Dental Research at jdr@iadr.org.

MANUSCRIPT REQUIREMENTS BY TYPE

The Journal of Dental Research accepts the following types of manuscripts for consideration:

Original Research Reports: These manuscripts are based on clinical, biological, and biomaterials and bioengineering subject matter. Manuscripts submitted as research reports have a limit of 3,200 words (including introduction, materials, methods results, discussion and; excluding abstracts, acknowledgments, figure legends and references); a total of 5 figures or tables; 40 references; and must contain a 300 word abstract.

Letters to the Editor*: Letters must include evidence to support a position about the scientific or editorial content of the JDR. Manuscripts submitted as a letter to editor have a limit of 250 words. No figures or tables are permitted. Letters on published articles must be submitted within 3 months of the article's print publication date.

Guest Editorials*: A clear and substantiated position on issues of interest to the readership community can be considered for this manuscript type. Guest Editorials are limited to 1,000 words. No figures or tables are permitted.

Discovery!: Essays that explore seminal events and creative advances in the development of dental research are considered for the "Discovery!" section of the

journal. Manuscripts submitted for "Discovery!" have a limit of 2,500 words and a total of 2 figures or tables. Manuscripts are to be submitted by invitation only.

Critical Reviews in Oral Biology & Medicine: These manuscripts should summarize information that is well known and emphasize recent developments over the last three years with a prominent focus on critical issues and concepts that add a sense of excitement to the topic being discussed. Manuscripts are to be submitted by invitation only. Authors interested in submitting to this section must contact the Editor of Critical Reviews in Oral Biology & Medicine, Dr. Dana Graves, at dgraves@iadr.org for submission approval and instructions. Manuscripts submitted as Critical Reviews have a limit of 4,000 words; a total of 6 figures or tables; 60 references; and must contain a 300 word abstract.

Additional Instructions for Critical Reviews:

-It is important to include several illustrations or diagrams to enhance clarity. Manuscripts that lack figures or diagrams typically receive a low priority score.

-Summarize important concepts in tables or flow charts or show critical data in the form of figures. NOTE: authors will need to obtain permission to reproduce a previously published figure or table.

-Due to the broad readership, abbreviations commonly recognized in one field may not be readily apparent to those in a different field. Keep abbreviation use to a minimum.

-The cover page, abstract, text, summary, figure legends, and tables should be combined into a single Word document. Figures should be submitted as a separate document.

-To view examples of recent Critical Reviews in the Journal, please click the following links:
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3318079/
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3327727/

*Brief responses to Letters to the Editor or Guest Editorials will be solicited for concurrent publication.

Clinical Reviews (formerly Concise Reviews): These manuscripts are generally systematic reviews of topics of high clinical relevance to oral, dental and craniofacial research. Meta-analyses should be considered only when sufficient numbers of studies are available. Manuscripts that include investigations of limited study quality of under- studied areas are typically not acceptable as topics for a clinical review. Although some systematic reviews may be well done, those that receive highest scientific priority will only be considered given the very limited space allowed for these reviews in the journal.

Manuscripts submitted as Clinical Reviews have a strict limit of 4,000 words (including introduction, materials, methods results, discussion and; excluding abstracts , acknowledgments, figure legends and references); a total of 6 figures or tables; up to a maximum of 60 references; and must contain a 300 word abstract. Manuscripts above the 4,000 word/6 figure or table limit may use supplemental appendices for other supporting information that would be available online only.

Additional Instructions for Clinical Reviews:

-It is important to include illustrations or diagrams to enhance clarity. Manuscripts that lack figures or diagrams typically receive a low priority score.

-Summarize important concepts in tables or flow charts or show critical data in the form of figures. NOTE: authors will need to obtain permission to reproduce a previously published figure or table.

-Due to the broad readership, abbreviations commonly recognized in one field may not be readily apparent to those in a different field. Keep abbreviation use to a minimum.

-The cover page, abstract, text, summary, figure legends, and table(s) should be combined into a single Word document. Figures should be submitted as a separate document.

-To view examples of recent Clinical Reviews in the Journal, please click the following links:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5613886/ or
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5004242/

All submissions must include a title page and be accompanied by a cover letter and list of suggested reviewers. Cover letters should certify the research is original, not under publication consideration elsewhere, and free of conflict of interest. Title pages should include: abstract word count, total word count (Abstract to Acknowledgments), total number of tables/figures, number of references, and a minimum of 6 keywords. Keywords cannot be words that have been included in the manuscript title. Key words should be selected from Medical Subject Headings (MeSH) to be used for indexing of articles. See: http://www.nlm.nih.gov/mesh/MBrowser.html for information on the selection of key words.

Please submit the names and email addresses of four preferred reviewers when prompted by the SAGETrack system. Preferred reviewers cannot be colleagues at the contributors' institution or present or former collaborators.

TITLES
Titles can consist of a maximum of 75 characters (including spaces). Titles do not normally include numbers, acronyms, abbreviations or punctuation. The title should include sufficient detail for indexing purposes but be general enough for readers outside the field to appreciate what the paper is about.

ACKNOWLEDGMENTS
Authors are required to report all sources of support for their project or study, including but not limited to: grant funds, commercial sources, funds from a contributors' institution. Do not refer to a study being "partially funded by the cited sources." Consultancies and funds paid directly to investigators must also be listed. Authors are required to specify during the submission process if their paper received funding from NIH, NIDCR, or any other NIH Institute or Center and provide the grant number. To comply with the NIH Public Access Mandate, for qualifying NIH- funded papers, the Journal of Dental Research will deposit the final, copyedited paper to PubMed Central on behalf of the authors.

Any perceived or actual conflicts of interest need to be identified in the acknowledgments section. The JDR abides by the International Committee of Medical Journal Editors guidelines for the Ethical Considerations in the Conduct and Report of Research (http://www.icmje.org).
Authors are requested to include this information in the acknowledgments section and the corresponding author must confirm that all co-authors have reported any potential conflicts.

Authors are required to provide a written statement of author contributions as part of your Acknowledgements. Include as many authors as you have, note their completed roles, and conclude with the following statement. "All authors gave their final approval and agree to be accountable for all aspects of the work."
For example:

Author contributions

Author 1: Contributed to conception, design, data acquisition and interpretation, drafted and critically revised the manuscript
Author 2: Contributed to conception, design, data acquisition and interpretation, performed all statistical analyses, drafted and critically revised the manuscript
Author 3: Contributed to conception, design, and critically revised the manuscript

FIGURE AND TABLE REQUIREMENTS

These guidelines are intended to aid authors in providing figures that will reproduce well in both print and online media. Submitting digital image files that conform to these guidelines will prevent delays in the review and publication processes, and maximize the published quality of your figures.

Figure Types
JDR figures can fall into one of three categories: Continuous-tone images, Line-art images, and Combination images. Each image type has specific requirements in terms of the resolution needed for publication and the file types best suited for the figure. See the following panels for examples and requirements.

Continuous-tone Image Minimum resolution: 300dpi. Preferred File Formats: TIFF, Bitmap.
Line-art Image Minimum resolution: 800dpi.
Preferred File Formats: EPS, PowerPoint, Illustrator.
Combination Image Minimum resolution: 800dpi. Preferred File Formats: PDF, EPS,
PowerPoint, Illustrator, InDesign

Resolution
In order for a figure to be used in publication, its Digital Image File must have the required resolution when it is created. The resolution cannot be raised after the original image is made. Attempting to do so (for example, with Adobe Photoshop's© "Image Size" command) results in the addition of artificial pixels that distort the image and lower its sharpness. The figures on the right show an example of this reduced sharpness.

Image Integrity Guidelines

The International Committee of Medical Journal Editors (ICMJE) recommendations note that scientific misconduct includes deceptive manipulation of images. Figures submitted to the Journal of Dental Research should be minimally processed and should reflect the integrity of the original data in the image(s). Adjustments to images in brightness, contrast, or color balance should be applied equally to the entire image, provided they do not distort any data in the figure, including the background. Selective adjustments and touch-up tools used on portions of a figure are not appropriate. Images should not be layered or combined into a single image unless it is stated that the figure is a product of time-averaged data. In the case of gel images, the grouping of lanes from different gels, fields or exposures must be made explicit by the arrangement of the figure (e.g. by the use of the dividing lines). All adjustments to image data, including the grouping of lanes from gels, should be clearly disclosed in the figure legend. Images may be additionally screened to confirm faithfulness to the original data. If original data cannot be provided by an author when requested, acceptance of the manuscript may be revoked. Authors are expected to supply raw image data upon request. Authors should also list tools and software used to collect image data and should document settings and manipulations in the Methods section.
These guidelines were derived from those provided by the Journal of Cell Biology and Nature: http://jcb.rupress.org/editorial-policies#data-integrity https://www.nature.com/authors/policies/image.html
Experimental controls

Appropriate controls should be provided for all experimental methods. For example, negative controls are needed for immunofluorescence (IF) and immunohistochemistry (IHC), i.e. control primary antibody or antibody plus excess antigen, which can be added as supplemental data. In addition, arrows should identify representative immunopositive cells that are clearly distinguished from background staining in IF and IHC images.

Fonts
Limit fonts used in any figure to Times, Times New Roman, Arial, Frutiger, and Sabon. Other fonts cannot be guaranteed to reproduce properly.

Files containing figures and tables should be clearly labeled to indicate their placement in the text or appendix. Tables should be viewable in a portrait view. Tables that are created in a landscape view are more suitable for an appendix.

If the online version is in color and the printed version in black and white, please submit separate files for each version. Figures should be identical except in color or grayscale. The cost of color figures in the print version will be borne by the authors. Rates for color reproduction are
$300 per initial page of color and $150 for each additional page of color. However, there are no charges for figures and diagrams printed in black and white. Color figures many be included in the online version of JDR with no extra charges.

REFERENCES

The Journal of Dental Research (JDR) adheres to the CSE (8th Edition) editorial style. All submitted manuscripts should be formatted in this style: http://www.scientificstyleandformat.org/Tools/SSF- Citation-Quick-Guide.html.

SUPPLEMENTAL FILES

Additional supporting data may be referenced as a supplemental appendix for publication online only. All supplemental appendix files must be submitted with the manuscript for review.
Supplementary files will be subjected to peer-review alongside the article.

Supplementary files will be uploaded as supplied. They will not be checked for accuracy, copyedited, typeset or proofread. The responsibility for scientific accuracy and file functionality remains with the authors. A disclaimer will be displayed to this effect with any supplementary material published. Supplemental files may include additional figures or tables that exceed the Journal's limit. Material intended for the supplemental appendix must have "supplemental" or "appendix" in the file name upon upload. When formatting your supplemental files, please follow these instructions:

- Authors should provide a single Word file with all Appendix content. Figures and tables should be included in the main Appendix file so they can appear immediately alongside their captions. High resolution figures may also be supplied separately if authors wish, but they also must be copied into the Word file so everything can be kept together.

- Be sure to run spell check and proofread the text.
- Remove all highlighting/other colors. Use one font throughout.
- The Appendix should include the title of the article and all authors. Page numbers are recommended.
- Figures and Tables should be labeled Appendix Figure/Table 1, Appendix Figure/Table 2, etc. Avoid labeling as S1, S2, and so forth.
- All table footnotes and figure legends should be included.
- Preferably, authors shouldn't label separate parts as "Appendix 1", "Appendix 2", etc.; just use section heads as in a regular article.

Language Editing: Manuscripts submitted for publication consideration should be written in English. Prior to submission, if a manuscript would benefit from professional editing, authors may consider using a language-editing service. Suggestions for this type of service can be found at www.iadr.org/EditingServices. The Journal of Dental Research does not take responsibility for, or endorse these services, and their use has no bearing on acceptance of a manuscript for publication.

GENERAL INFORMATION FOR AUTHORS SUBMITTING A MANUSCRIPT

PRIOR PUBLICATION

Manuscripts submitted to the Journal of Dental Research are accepted for consideration giving the understanding that it contains original material that has not been submitted for publication or has been previously published elsewhere. Any form of publication other than an abstract only constitutes prior publication.

Manuscripts posted or submitted to a non-commercial preprint server are not considered previously published. Submitting authors will be required to disclose if the manuscript has been posted or submitted to a non-commercial preprint server.

ICMJE COMPLIANCE STATEMENT

Manuscript submission guidelines for the Journal of Dental Research follow the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" set forth by the International Committee of Medical Journal Editors (ICMJE). For additional information please visit the ICMJE web site at http://www.icmje.org/.

CONSORT 2010 CHECKLIST COMPLETION RANDOMIZED CLINICAL TRIALS POLICY

Manuscripts reporting a randomized clinical trial are required to follow the CONSORT guidelines. The Journal requires authors of studies involving laboratory animals submit with their manuscript the full version of the Animal Research: Reporting In Vivo Experiments (ARRIVE) 2.0 checklist. Authors of human observations studies in epidemiology are required to review and submit a STROBE statement. When uploaded to the SAGETrack system, any checklists completed by authors should be given a supplementary file designation. Authors who have completed the ARRIVE or STROBE checklist should include as the last sentence in the Methods section a sentence stating compliance with the appropriate guidelines/checklist.

Additional guidance on compliance with various research guidelines can be found on the Guideline Information - Enhancing the Quality and Transparency of Health Research: www.equator-network.org.

The CONSORT checklist can be downloaded from: http://www.equator-network.org/reporting-guidelines/consort/

The ARRIVE guidelines can be found here: https://arriveguidelines.org/resources/author-checklists The STROBE checklists can be found here: www.strobe-statement.org/index.php?id=strobe-home

The Journal of Dental Research requires authors to register their clinical trials in a public trials registry. Authors of manuscripts describing such studies are asked to submit the name of the registry and the study registration number prior to publication. Authors are asked to include their clinical trial registration number at the end of their

abstracts. In accordance with the aforementioned "Uniform Requirements for Manuscripts Submitted to Biomedical Journals," clinical trials will only be considered for publication if they are registered.

INSTITUTIONAL REVIEW BOARD AND WRITTEN INFORMED CONSENT

For protocols involving the use of human subjects, authors should indicate in their Methods section that subjects' rights have been protected by an appropriate Institutional Review Board and written informed consent was granted from all subjects. When laboratory animals are used, indicate the level of institutional review and assurance that the protocol ensured humane practices.

PUBLIC GENE DATA

Prior to submission, the Journal of Dental Research asks that novel gene sequences be deposited in a public database and the accession number provided to the Journal. Authors may want to use the following Journal approved databases:

GenBank: www.ncbi.nlm.nih.gov/Genbank/submit.html

EMBL: www.ebi.ac.uk/embl/Submission/index.html

DDBJ: https://www.ddbj.nig.ac.jp/index-e.html

Manuscript submissions including microarray data should include the information recommended by the MIAME guidelines in their submission, and/or identify the submission details for the experiments details to one of the publicly available databases such as Array Express or GEO. Information on MIAME, Array Express and GEO can be found by clicking on the corresponding links below:

MIAME: http://fged.org/projects/miame/

ArrayExpress: http://www.ebi.ac.uk/arrayexpress

GEO: http://www.ncbi.nlm.nih.gov/geo

FUNDING COMPLIANCE STATEMENT

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Book chapter, or an article within a book

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. p. 251-306.

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Complete book, authored

Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

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Healthwise Knowledgebase. US Pharmacopeia, Rockville. 1998. http://www.healthwise.org. Accessed 21 Sept 1998.

Supplementary material/private homepage

Doe J. Title of supplementary material. 2000. http://www.privatehomepage.com. Accessed 22 Feb 2000.

University site

Doe, J: Title of preprint. http://www.uni-heidelberg.de/mydata.html (1999). Accessed 25 Dec 1999.

FTP site

Doe, J: Trivial HTTP, RFC2169. ftp://ftp.isi.edu/in-notes/rfc2169.txt (1999). Accessed 12 Nov 1999.

Organization site

ISSN International Centre: The ISSN register. http://www.issn.org (2006). Accessed 20 Feb 2007.

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