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Review Article

Multilevel factors appealing to junk food consumption among school children and adolescents: A systematic review

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Abstract

Junk food consumption (JFC) is increasing and it is common mostly among schoolchildren and adolescents (SCA). The consequences of JFC have become a public health concern. The study aims to explore the factors associated with the JFC among SCA using socio-ecological model (SEM). Electronic databases such as PubMed, Google Scholar, ResearchGate, and bibliographic references were used to obtain the related papers following the standard process of identification, screening, eligibility assessment, study quality assessment, and data extraction from the selected articles. Strengthening the reporting of observational studies in the epidemiological (STROBE) checklist was used to assess the quality standards of the papers. Out of the 785 papers, we synthesized the results from 22 quantitative articles based on merits. The findings of the study indicate that JFC Behavior among the SCA is influenced by multilevel factors that extend from intrapersonal to public policy through interpersonal, organizational, and community levels. The results of the study suggest that more than two-thirds, more than one-third, near to one-third, and half of them supported with microsystem, mesosystem, exosystem, and macrosystem constructs of the SEM respectively. However, age, sex/gender, taste and pleasure of eating junk food, knowledge of junk food and attitude towards dietary choices of the microsystem (individual factors) and mass media exposure and marketing strategies of the macrosystem (public policy factors) remain the most influencing systems. The results indicate that individual and public policy level constructs are important to explaining JFC among the SCA. This implies that the researchers and policymakers need to consider multilevel factors while designing and implementing the school-based nutrition education programme to promote healthy dietary outcomes in the SCA.

Keywords: adolescents, dietary behaviors, fast food consumption, nutrition education, socio-ecological model (SEM), young children

Introduction

Junk food consumption (JFC) is increasing globally (Baraldi et al., 2018; Mandoura et al., 2017), and this trend is most alarming in low-and-middle-income countries (LMICs) (Baker & Friel, 2016; Saha et al., 2021). JFC is particularly common among school children and adolescents [SCA] (Gupta et al., 2018; Moradi Latreyi et al., 2020; Sahoo et al., 2015; Silva et al., 2021; Upreti et al., 2020). Junk foods are energy-dense foods with high sugar, fat, and salt but low or no nutrients such as protein, fiber, vitamins, and minerals (Ashakiran & Deepthi, 2012; Datar & Nicosia, 2012; Kaushik et al., 2011). However, junk foods encompass a wide array of foods, including at least four categories: sweet foods, sweet beverages/sugary drinks, salty snacks, and fast foods. Sweet foods include biscuits, chocolates and candies, bakeries, sweets, etc. The sweet beverages include soda, cola, juicy, apple cider, beer, etc. The salty foods include noodles, cheese balls, potato chips, popcorn, papad, puffed rice, etc. The fast foods include *Samosa, Pakauda, Pizza, Chowmein, Mo:Mo,* hot dogs, burgers, sausage, French fries, etc. Junk foods contain high calories, refined salt, poly saturated fat, trans fat, monosodium glutamate (MSG), colours, artificial sweeteners, toppings, and some other additives (Arya & Mishra, 2013; Ashakiran & Deepthi, 2012; Kaushik et al., 2011). The terms such as 'junk food', 'ultra/processed food', 'hyper-palatable food', 'fast food', 'instant food', 'sugar-sweetened beverage', 'unhealthy snack food', and 'snack food' are often used interchangeably (Vignola et al., 2021) and so is the case in this paper.

JFC and its consequences have become a growing public health concern (Bohara et al., 2021; Vaida, 2013). There is a growing evidence that JFC is a leading cause of preventable diet-related diseases and untimely deaths (Vignola et al., 2021). Premature deaths and preventable illnesses from diet-related non-communicable diseases have also increased substantially around the globe, including in Nepal (Gupta et al., 2018; Neupane, 2014). It has negative health consequences for people of all ages and school children and teenagers are particularly more vulnerable (Neupane, 2014). These days, young people's nutritional behaviors have shifted away from homemade staple foods to industrially processed foods (Bohara et al., 2021; Upreti et al., 2021). Particularly, JFC has become a common snacking practice among SCA in Nepal (Neupane, 2014; Poudel et al., 2018; Poudel, 2018; Sapkota & Neupane, 2017; Upreti et al., 2020; Upreti et al., 2021). Evidence indicates that dietary habits acquired in childhood and adolescence persist throughout life. Furthermore, the role of childhood nutrition greatly impacts adult health (Kelder et al., 1994). Schools are perceived as powerful settings that influence young children's behaviors (Centers for Disease Control Prevention (CDC), 2011; World Economic Forum, 2020) since they provide an optimal supportive setting to practice healthy eating behaviors and lifestyles leading to proper nutrition behavior outcomes and healthy lifestyles in the later stages of life (Harake et al., 2018). Therefore, it is a must to uncover why SCA loves to consume junk foods before schools adopt strategic programmes. In the given context, this review study aims to explore the factors associated with JFC among SCA using socio-ecological model (SEM).

Major Constructs of SEM applied to this Study

The purpose of this study is to explain the findings of the review from theoretical frameworks of the SEM, which are widely regarded as a standard framework for conceptualizing the links between individual behavior and socio-environmental variables (Sallis et al., 2008). The SEM asserts that human behavior is influenced by various factors, including intrapersonal, interpersonal, organizational, community and policy-level systems (McLeroy et

al., 1988). Bronfenbrenner (1979) describes four major influences viz. microsystem, mesosystem, exosystem, and macrosystem that influence human behaviors. Further, these four-level influencers are nearly compatible with McLeroy's model. In the present study, the microsystem represents the intrapersonal influence, which consists of biological and behavioral predisposing factors. The mesosystem represents the interpersonal influence, including interactions among the individuals those closest to family, peers, relatives, and teachers. The exosystem includes organisational and community-level influences. And the macrosystem represents environmental factors that include socio-cultural influence, marketing strategies, and public policy and programmes. It is anticipated that the interplay between these influences appeals to JFC among SCA.

Methods and Materials

Search Strategies

This study followed the systematic search strategy (Purssell & McCrae, 2020) to find research-based articles. For this purpose, we searched the literature using electronic databases such as PubMed, Google Scholar, ResearchGate, and bibliographic references. We used an advanced search strategy using key terms such as 'Junk food', 'Fast food', 'Proceed food', 'School student', 'School children', 'School adolescent', 'School-aged children', 'School going children', 'Determinants', 'Factors', 'Influences' using appropriate Boolean operators and truncation (AND, OR, NOT, and *) as required in PubMed and Google Scholar databases. In the advanced search, we used key terms choosing the title option among the others. The strategy for the advanced search was *((Junk food OR Fast food OR Processed food) AND (School student OR School children OR School adolescent OR School-aged children OR School going student OR Pupil)) AND (Determinant OR Factors OR Influence)*. In total, 776 articles were detected from PubMed, Google Scholar and ResearchGate. In addition, we extracted nine articles from bibliographic sources. Altogether, 785 articles were identified, amongst which 22 were included in the review. We used EndNote reference management software (version 9) to store the search outputs. We spent two weeks, from the last week of February to the first week of April 2022, identifying and shortlisting the papers for review.

Inclusion and Exclusion Criteria

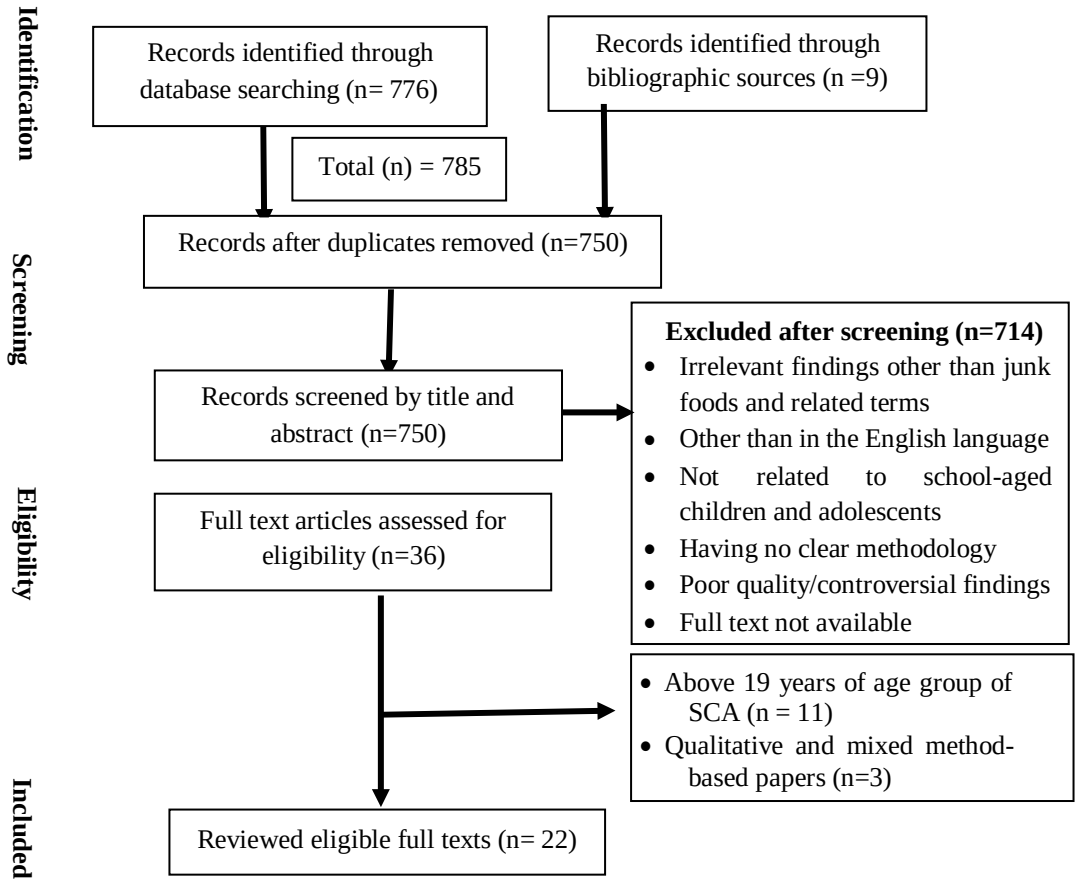
The papers published in the English language from January 2015 to February 2022 were recorded in this study. The papers reported JFC practice and associated factors, study participants of 6 to 19 years, open access journal articles, full-text available, quantitative observational, case-control, cohort, cross-sectional, or interventional studies were included in this study.

On the other hand, we excluded articles other than in the English language, participants other than SCA, studies that did not report junk food consumption and/or contributing factors, papers published before 2015, a qualitative or mixed method adopted, and review or meta-analysis review studies.

This study followed the fundamental rules of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Moher et al., 2015) while keeping the literature records. Figure 1 outlines the details of the PRISMA procedure.

Figure 1

PRISMA Flow Diagram of the Study



Quality Assessment

Among the authors, YRU and DA worked together independently to assess article quality from the searched articles. If there was a doubt on quality of the articles, the next author (BD) was consulted for the final decision. Details of the study design, study population characteristics, outcome measures, and study quality were assessed for each study that met the inclusion criteria. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement/guidelines to assess the quality of the literature (Purssell & McCrae, 2020). The STROBE checklist was used to assess article quality by YRU and DA. Further, YRU and BNY were involved in evaluating the findings of the papers from the perspective of SEM (Bronfenbrenner, 1979; McLeroy et al., 1988).

Data Synthesis

Because the included studies varied greatly in research locations, designs, and outcome measures, meta-analyses could not incorporate all the data. As a result, we employed a narrative synthesis to present each study's details and discuss them individually (Purssell & McCrae, 2020).

Results

After completing different stages of the PRISMA procedure, 22 articles were retained (see Figure 1) to review the factors appealing to JFC in SCA. Of the 22 studies, 19 studies were quantitative, and three were interventional quantitative. Most studies were undertaken in Asian countries, particularly in Nepal. However, the literature represents from around the globe. All studies were concentrated on exploring the determinants of JFC among in-school or/and SCA aged 6-19 years. The results of the studies have been presented under the five major domains, such as authors' name and date, study design, country, factors influencing JFC, and factors lying under the SEM's major constructs (Table 1).

Table 1

Factors Appealing Junk Food Consumption (n=22)

Authors and date	Study design	Country	Factors influencing JFC	Major constructs of SEM			
				Microsystem	Mesosystem	Exosystem	Macrosystem
Feyzabadi et al. (2017)	Quantitative: Cross-sectional	Iran	Taste and sensory perception, knowledge and self-efficacy of students, parenting practices, SES level of parents, social norms, and pressure	✓	✓	✓	x
Hansstein et al. (2017)	Quantitative: Longitudinal study	China	Media exposure like watching online videos and playing computer games	NA	NA	NA	✓
Lwin et al. (2017)	Quantitative: Cross-sectional	Indonesia	Parental mediation, broadcast media, and social media exposure	X	✓	x	✓
Sapkota and Neupane (2017)	Quantitative: Cross-sectional	Nepal	Taste of junk foods and advertisements in the media	✓	x	x	✓
Baraldi et al. (2018)	Quantitative: Cross-sectional	USA	Sociodemographic characteristics such as age, family income and caste/ethnicity	✓	✓	NA	NA
Chalise (2018)	Quantitative: Intervention study	Nepal	Taste of foods, easy availability, and advertisement	✓	x	✓	✓
Gupta et al. (2018)	Quantitative: Cross-sectional	India	Taste of junk foods	✓	x	x	x
Poudel et al. (2018)	Quantitative: Cross-sectional	Nepal	Sedentary, attitude towards Accessibility of pocket money, peer influence, home environment, and exposure to mass media and promotion	✓	✓	✓	✓
Noll et al. (2019)	Quantitative: Cross-sectional	Brazil	Presence of a school canteen	x	NA	✓	NA
Singh et al. (2020)	Quantitative: Quasi-intervention	Nepal	Behavioral intention of junk food consumption, attitudes toward junk food consumption, and perceived behavioral control toward junk food	✓	NA	NA	NA

Delfino et al. (2020)	Quantitative: Cross-sectional	Brazil	Food advertisements on TV	NA	NA	NA	✓
Dowarah et al. (2020)	Quantitative: Cross-sectional	India	Age, access to pocket money, the taste of foods, and advertisement	✓	NA	✓	✓
Li et al. (2020)	Quantitative: Cross-sectional analytical	LMICs	Age, sex, BMI, food insecurity, smoking, physical activity level, and sedentary behavior level	✓	NA	✓	NA
Moradi Latreyi et al. (2020)	Quantitative: Cross-sectional analytical	Iran	Exposure to junk food advertisements	X	x	NA	✓
Pahari and Baral (2020)	Quantitative: Cross-sectional	Nepal	Sex and grade	✓	NA	x	x
Acharya et al. (2021)	Quantitative: Cross-sectional	Nepal	Grade of students and gender	✓	NA	NA	x
Bohara et al. (2021)	Quantitative: Cross-sectional	Nepal	Family and peer roles, school type, family type, availability	X	✓	✓	x
Bui et al. (2021)	Quantitative: Longitudinal	China	Eating while doing other activities and emotional eating	✓	x	x	NA
Kearney et al. (2021)	Experimental (RCT study)	United Kingdom	Exposure to a television advertisement	X	x	x	✓
Silva et al. (2021)	Quantitative: Cross-sectional	Brazil	Age, living with parents, mother's schooling, attitude towards body image, eating meals living with parents, watching TV, and sedentary behavior	✓	✓	x	✓
Subedi and Bhusal (2021)	Quantitative: Cross-sectional	Nepal	Gender, knowledge of junk food, attitude towards food choice, peer influence, pocket money, family income, family occupation, family education level, and marketing strategy.	✓	✓	NA	✓
Upreti et al. (2021)	Quantitative: Cross-sectional	Nepal	Food and nutrition knowledge, sharing knowledge among classmates, grade/class of students, and parents' occupation.	✓	✓	x	x

Note. ✓indicates significantly associated and x indicates not associated, NA= Not applicable/mentioned

The study's findings suggest various factors that appeal to JFC among SCA. These multilevel factors are presented under the four major constructs of the SEM.

The Intrapersonal Factors: Microsystem Influences

The study demonstrates that the intrapersonal factors under the microsystem include age, sex, health condition, BMI, educational level, knowledge, attitude and belief, self-efficacy, lifestyle, eating habits, health-seeking behavior, taste, pleasure, and emotion of eating junk food. One-fourth of the reviewed studies demonstrated that the role of sensory perception of taste appeal to JFC (Acharya et al., 2021; Chalise, 2018; Dowarah et al., 2020; Feyzabadi et al., 2017; Gupta et al., 2018; Pahari & Baral, 2020; Sapkota & Neupane, 2017). A couple of cross-sectional studies found individual level factors such as age, sex/gender, and BMI are associated with JFC (Baraldi et al., 2018; Dowarah et al., 2020; Li et al., 2020; Pahari & Baral, 2020; Subedi & Bhusal, 2021). Baraldi et al. (2018) demonstrated that the caste and ethnicity of SCA influence JFC. A quasi-interventional study conducted in Nepal found a significant association of JFC with consumers' behavioral intention, attitude, and perceived behavioral control (Singh et al., 2020). A couple of studies demonstrated the association between educational level (grade) and academic performance of children and adolescents with their JFC (Subedi & Bhusal, 2021; Upreti et al., 2021). Food and nutrition knowledge (Feyzabadi et al., 2017; Subedi & Bhusal, 2021; Upreti et al., 2021) and self-efficacy (Feyzabadi et al., 2017) are revealed as significant determinants of JFC. Behavioral aspects include smoking, drinking, physical activity, sedentary lifestyle, changing lifestyle, and eating habits (Bui et al., 2021; Li et al., 2020; Silva et al., 2021) are found to be significant determinants of JFC. Of the 22 studies, taste and pleasure of eating junk foods remain the most common intrapersonal level (microsystem) factors that appeal to JFC. It is followed by the age, sex/gender, knowledge of junk food and attitude towards dietary choices of SCA.

The Interpersonal Factors: Mesosystem Influences

The interpersonal factors include formal and informal social networks and social support systems, which govern person-to-person linkages and relations (McLeroy et al., 1988). Of 22 studies, more than one-third of them were significantly associated with interpersonal level factors that consist of peer influences, parental mediation, familial roles and home environment that influence JFC among SCA. A home environment with family roles and practices was observed to significantly influence JFC (Baraldi et al., 2018; Bohara et al., 2021; Poudel et al., 2018). A couple of studies found parenting practices influence JFC among SCA (Feyzabadi et al., 2017). Some other studies revealed that parents' education, family income, occupation, and SES are associated with SCA's unhealthy dietary behaviors (Baraldi et al., 2018; Feyzabadi et al., 2017; Subedi & Bhusal, 2021; Upreti et al., 2021). Similarly, the availability of junk foods and accessibility of pocket money among SCA were found to be appealing factors for JFC (Dowarah et al., 2020; Poudel et al., 2018; Subedi & Bhusal, 2021; Upreti et al., 2021). Furthermore, a couple of the studies demonstrated that the role of peer influence appeal JFC among SCA (Bohara et al., 2021; Poudel et al., 2018; Subedi & Bhusal, 2021; Upreti et al., 2021). The above results suggest that familial environment and peer influence markedly influence JFC among SCA.

The Organizational and Community Factors: Exosystem Influences

The SEM asserts that organizational and community-level factors, also termed Exosystem to this study, consisting of organizational characteristics and inter-organizational relationships, are significant factors influencing individuals' behaviors (McLeroy et al., 1988). The seven studies out of 22 reviewed in this study showed that JFC was significantly associated with the availability of a canteen inside the school; school food serving environment; availability and access of junk food; food insecurity; and social norms and pressure (Bohara et al., 2021; Chalise, 2018; Dowarah et al., 2020; Feyzabadi et al., 2017; Li et al., 2020; Noll et al., 2019; Poudel et al., 2018). A study from India found that the presence of a school canteen was linked to a higher likelihood of consuming ultra-processed foods (Noll et al., 2019). A couple of studies examined the role of the easy availability of junk food and its access appeal to JFC (Bohara et al., 2021; Chalise, 2018). A cross-sectional study conducted in LMICs found that food insecurity in the community is significantly correlated with fast-food consumption (Li et al., 2020). In the same fashion, a cross-sectional study conducted in Iran demonstrated that social norms and pressure are significantly associated with unhealthy snacking behaviors (Feyzabadi et al., 2017). The above results suggest that easy availability and access to pocket money mostly appeal to SCA towards JFC more than other factors.

The Policy Level Factors: Macrosystem Influences

Public policy, the outermost layer in McLeroy's SEM (McLeroy et al., 1988), is also termed a macro level influence system in Bronfenbrenner's ecological theory (Bronfenbrenner, 1979). The present study, at its public policy level, discusses the role of mass media, social media networking, and marketing strategies influencing JFC among SCA. Of the 22 studies, half of them demonstrated mass media exposure and marketing strategies significantly influencing the JFC among the SCA. A couple of studies discuss that frequent exposure to advertisements and mass media significantly influences the JFC behaviors among young people (Delfino et al., 2020; Dowarah et al., 2020; Hansstein et al., 2017; Lwin et al., 2017; Moradi Latreyi et al., 2020; Poudel et al., 2018; Sapkota & Neupane, 2017; Subedi & Bhusal, 2021). A randomized control trial in the United Kingdom also demonstrated that frequent exposure to television advertisements increases high sugar-enriched foods and beverages intake (Kearney et al., 2021). Another interventional study in Nepal also revealed that junk food promotional activities influence the JFC behaviors of in-school children (Chalise, 2018). The above results suggest that mass media exposure and marketing strategies are the powerful determinants of JFC among SCA.

Discussion

In this review, we attempted to explore multilevel factors appealing to JFC among SCA. These multilevel factors are explained under the four major constructs of the SEM. More than two-thirds of the reviewed studies (15 studies) demonstrated that JFC among SCA was influenced by individual factors (microsystem influences), which include age, sex/gender, taste and pleasure of eating junk food, knowledge of junk food and attitude towards dietary choices. Similarly, more than two-thirds of the studies demonstrated that JFC among SCA was influenced by interpersonal factors (Mesosystem influences), which include parenting style,

family role and environment, peer influences, and knowledge sharing. Among these, familial environment and peer influences are the leading factors associated with JFC. One-third of studies also demonstrated that JFC among SCA was influenced by the organizational and community level factors (Exosystem influences), which include social norms and pressure, junk food availability, access to pocket money, food insecurity in the community, and canteen availability in the school. Among these, the availability of junk food and access to pocket money for SCA are the leading factors associated with JFC. Half of the reviewed studies demonstrated that JFC among SCA was influenced by public policy factors (macrosystem influences), which include promotional activities like mass media exposure and marketing strategies of the companies. The evidence from the previous study also demonstrated that a range of factors such as taste, brand reputation, accessibility, location, price, hygiene practice, variety, promotional offers, and timely service, were significantly associated with fast food consumption among South Asian college students (Saha et al., 2021). The above discussion indicates that the findings of this review study are streamlined with the major constructs of the SEM, which asserts that JFC among SCA are influenced by individual behaviors to socio-environmental factors.

Conclusion

The present study indicates that JFC behavior among SCA is influenced by factors ranging from intrapersonal, interpersonal, organizational, and community to public policy level systems. However, intrapersonal factors like age, sex/gender, taste and pleasure of eating junk food, knowledge of junk food and attitude towards dietary choices and public policy factors like mass media exposure and marketing strategies remain the most influencing factors that appeal to JFC. Based on the above discussion, this study concludes that among the four major constructs of the SEM, individual level (microsystem) factors mostly influence JFC among SCA, followed by public policy (macrosystem), organizational, interpersonal level (mesosystem), and community (exosystem), and factors. We anticipate that the findings of this study could be useful in planning and implementing the school-based multi-pronged nutrition education interventions by focusing on multilevel factors that appeal to JFC among SCA to promote healthy dietary outcomes. These findings could be taken into account by policymakers while making/designing the policy and intervention programmes.

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Authors' Contribution

YRU designed the concept of the paper, developed the protocol, searched the literature through the database, evaluated them, synthesized the study's outcomes, and discussed the results. DA searched the literature through the database. DA and BNY were involved in the quality assurance of the literature. Further, BNY was also involved to discuss the results from

the SEM perspective. BD and TRB reviewed the paper and edited it with critical inputs. All the authors read and approved the final manuscript and agreed to submit it for publication.

Conflict of Interest

The authors declared no conflict of interest for the authorship and publication of this paper.

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