The Journal of Nutrition
Nutritional Epidemiology

Dietary Patterns Track from Infancy to Preschool Age: Cross-Sectional and Longitudinal Perspectives[1–3]

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Abstract

Background: Although it has been suggested that dietary patterns emerge early in life, less is known about the extent to which they track through the toddler and preschool ages.

Objectives: The objectives of this study were to derive cross-sectional dietary patterns at 2, 3, and 5 y of age and assess their correlations and to derive multi–time point dietary patterns from ages 2–5 y and assess their associations with sociodemographic factors and infant feeding patterns.

Methods: Depending on the age considered, analyses included 989–1422 children from the EDEN (Étude des Déterminants pré- et postnatals précoces du développement et de la santé de l'ENfant) mother–child cohort. Dietary intake was collected with the use of food-frequency questionnaires at 2, 3, and 5 y of age. Principal component analyses were applied to these data, first cross-sectionally at each age, then longitudinally accounting for the data collected at all 3 ages. Tracking between patterns was estimated by Spearman correlation coefficients and associations with either the infant feeding patterns or the demographic and socioeconomic factors were assessed with the use of multivariable linear regression analyses.

Results: Overall, we derived 2 main cross-sectional patterns labeled "Processed and fast foods" and "Guidelines," the latter being characterized by intakes approximating age-specific dietary guidelines; and 2 multi–time point dietary patterns that corresponded to consistent exposures to similar foods across the 3 ages. The first, labeled "Processed and fast foods at 2, 3, and 5 y," was inversely associated with maternal education and age, and positively associated with the presence of older siblings. The second, called "Guidelines at 2, 3, and 5 y," was predicted by maternal education. Moderate tracking was observed between similar patterns assessed at different ages.

Conclusions: Our findings confirmed the emergence of dietary profiles socially differentiated early in life as well as a moderate tracking of the diet. The promotion of healthy dietary trajectories should be encouraged as early as infancy, in particular in the presence of older siblings and among the most socially disadvantaged population groups. *J Nutr* 2015;145:775–82.

Keywords: dietary patterns, tracking, toddlers, preschool children, EDEN, principal component analysis, socioeconomic position

Introduction

Early childhood is a period of rapid growth, associated with changing physiologic requirements and nutritional needs. There is now growing evidence suggesting that early childhood is a critical period during which susceptibility to many chronic diseases is established (1, 2). Nutrition, in particular, is a major driver of adequate early life development, and the consequences of under- and/or overnutrition in early life have been well documented (3).

The transition in diet from infancy to preschool age also marks important changes in terms of social and educational developments (4, 5) as the child progressively moves from the close family

[1] Support for the EDEN (Étude des Déterminants pré- et postnatals précoces du développement et de la santé de l'ENfant) study was provided by the following organizations: Foundation for Medical Research (FRM), National Agency for Research (ANR), National Institute for Research in Public Health (IRESP: TGIR cohorte santé 2008 program), French Ministry of Health (DGS), French Ministry of Research, INSERM Bone and Joint Diseases National Research (PRO-A) and Human Nutrition National Research Programs, Paris–Sud University, Nestlé, French National Institute for Population Health Surveillance (InVS), French National Institute for Health Education (INPES), the European Union (FP7, MeDALL project), Diabetes National Research Program [through a collaboration with the French Association of Diabetic Patients (AFD)], French Agency for Environment Security (AFSSET), Mutuelle Générale de l'Education Nationale, a complementary health insurance (MGEN), French National Agency for Food Security, and French Speaking Association for the Study of Diabetes and Metabolism (ALFEDIAM). The study sponsors were not involved in the study design, data collection, or data analyses.

[2] Author disclosures: S Lioret, A Betoko, A Forhan, M-A Charles, B Heude, and B de Lauzon-Guillain, no conflicts of interest.

[3] Supplemental Tables 1 and 2 are available from the "Online Supporting Material" link in the online posting of the article and from the same link in the online table of contents at http://jn.nutrition.org.

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Manuscript received August 7, 2014. Initial review completed September 23, 2014. Revision accepted December 29, 2014.
First published online January 28, 2015; doi:10.3945/jn.114.201988.

(in particular the parents) to the external world (e.g., caregivers, childcare, and preschool). Within this changing environment, early childhood food exposures influence the development of taste and food preferences, which in turn have an impact on subsequent eating habits (6, 7). Dietary patterns have indeed been suggested to emerge early (8–11), and to track through infancy (8) into later childhood (12), and from childhood to adulthood (13).

The analysis of dietary patterns has been widely used over the last decade, because it allows for the synthesis of a large number of dietary data into a measure of the whole diet, accounting for the complex interactions between foods and nutrients. Dietary patterns therefore represent a relevant and robust alternative to the traditional single-food or single-nutrient approaches (14). Principal component analysis (PCA), an empirical data-driven approach, is the method that has been used mainly to derive dietary patterns in children aged 1–5 y, as recently reviewed by Smithers et al. (9).

The objectives of the present study were to derive cross-sectional dietary patterns at 2, 3, and 5 y of age in the EDEN (Étude des Déterminants pré- et postnatals précoces du développement et de la santé de l'ENfant) mother–child cohort and to assess the extent to which dietary patterns identified at a given age were correlated to those obtained at later ages. We also aimed to derive multi–time point dietary patterns including simultaneously data collected at 2, 3, and 5 y of age and to assess if these were predicted by sociodemographic factors and the infant feeding patterns previously described in the same cohort (15).

Methods

Study design and participants

The EDEN mother–child study is a prospective cohort that aimed to assess pre- and postnatal determinants of child growth, development, and health, and it has been described elsewhere (16). In brief, between 2003 and 2006, 2002 pregnant women (<24 wk of gestation) aged 18–45 y were recruited at Nancy and Poitiers university hospitals. Exclusion criteria were multiple pregnancies, diabetes history, illiteracy in French, and planning to move outside the delimited recruitment sites in the next 3 y. Approval for the study was obtained from the Bicêtre Hospital Ethics Committee and the National Committee for Processed Data and Freedom. Written consent was obtained from each participant.

Measurements

Data used in the current study were collected with the use of self-reported questionnaires completed by the mothers at different stages of the follow-up, including for the mother during pregnancy (24–28 wk of gestation) and for the child at ages 2, 3, and 5 y.

Dietary data. Three feeding patterns were previously identified over year 1 of life by Betoko et al. (15) with the use of PCA on data collected at birth and 4, 8, and 12 mo of age, i.e., breastfeeding duration, age of introduction to 14 complementary foods, and type of food used at 12 mo of age (i.e., prepackaged baby food, adult food, or homemade food). The first pattern was labeled "Later dairy product introduction and use of prepackaged baby foods," given the positive factor loadings concerning both the age of introduction of all dairy products and the use of prepackaged baby-foods; the second pattern was the closest to infant feeding guidelines in terms of breastfeeding duration, age of weaning, and the use of homemade foods, and was thus labeled "Longer breastfeeding, later main meal food introduction, and use of homemade foods;" the third pattern was mainly characterized by the use of prepackaged not baby-specific foods and was thus called "Use of prepackaged adult foods."

Children's dietary intakes at 2, 3, and 5 y of age were collected with the use of FFQs. These were short versions of the FFQ used by mothers during their pregnancies, which was validated in adults and adolescents (17). In these short versions, the food classification was established based on similarities in food type and context of consumption and was set to be able to describe the patterns of the child's diet. These 3 FFQs included 26 common food groups, along with 7 possible responses ranging from "Never" to "Several times per day" that were converted into weekly frequencies ("Never" was coded as zero, "<1 time/mo" as 0.125 per week, "1–3 times/mo" as 0.5 per week, "1–3 times/wk" as 2 times/wk, "4–6 times/wk" as 5 times/wk, "1 time/d" as 7 times/wk, and "Several times/d" as 14 times/wk). Diet and nondiet carbonated soft drinks were assembled into a single food category at all ages (with their frequencies of consumption summed) because of a relatively high proportion of nonconsumers of diet soft drinks (i.e., >65%). Additional questions (outside of the FFQ) allowed us to determine the frequency of milk intake at 2 and 3 y of age (number of times per day) and of intake of various types of baby foods at 2 y of age (assembled into a single group; number of times per week). Breaded fish and milk were included as additional items in the FFQ at 3 and 5 y of age, respectively. Overall, 27 food group variables were available at 2 and 3 y of age, and 26 at 5 y of age, covering the whole diet (listed in the Results section).

Sociodemographic variables. Maternal education and household income were obtained from the questionnaire completed by the mother during her pregnancy (missing data were substituted by the modal class value in <5% of mothers). Each mother's prepregnancy height and weight were also reported and maternal BMI (kilograms per meter squared) was categorized as follows: thin (<18.5), normal (≥18.5–<25), overweight (≥25–<30) and obese (≥30). Clinical records provided data on maternal age at delivery, gestational age (weeks of amenorrhea), birth weight, and parity.

Population studied. Of the 2002 women initially recruited, 96 no longer continued in the study after delivery, 4 were excluded because of intrauterine death, and 3 because of delivery outside the geographic area of the study, resulting in 1899 eligible children at birth (**Figure 1**).

The FFQs at 2, 3, and 5y of age were completed by 1436, 1321, and 1195 mothers, respectively. At each age, children with more than one-third of missing dietary variables were excluded from analyses (n = 14 at age 2 y, n = 12 at age 3 y, and n = 13 at age 5 y). Otherwise, we replaced the missing data by the modal value of the distribution (n = 134 at age 2 y, n = 71 at age 3 y, and n = 56 at age 5 y, with most children having 3 or fewer missing variables). Dietary data were therefore available for analysis for 1422, 1309, and 1182 children at 2, 3, and 5 y of age, respectively. Multi–time point patterns were assessed in the 989 children with data at all 3 ages. We deliberately chose to derive cross-sectional dietary patterns within a maximum sample at each age.

Statistical analyses

We described the children from the EDEN cohort who had all dietary data available at ages 2, 3, and 5 y (n = 989). Sociodemographic factors were then compared between this sample and the children eligible at birth but not included in the analysis because of dropping out, exclusion, or missing data (n = 910). Chi-square and Student's t tests were used to compare frequencies and means, respectively.

Cross-sectional dietary patterns were first derived independently at ages 2, 3, and 5 y with the use of PCA of the 26 or 27 standardized dietary variables. The number of patterns was selected considering eigenvalues >1.0, the scree plot, and the interpretability of the patterns (18, 19). To interpret the results and provide a label for a given pattern, we considered the items most strongly related to that pattern, i.e., those for which the absolute value of the loading coefficient (which is the correlation of each variable with the given dietary pattern) was >0.30. The PCA scores for each dietary pattern were calculated at the individual level by summing the observed standardized frequencies of consumption per food group, weighted according to the PCA loadings.

Multi–time point dietary patterns were then derived, including the standardized dietary variables defined at all 3 ages, i.e., 2, 3, and 5 y of age, in a single PCA (n = 989). The same criteria were addressed to retain and label the resulting patterns. This multi–time point application of PCA was previously used by Brazionis et al. (20) to assess transition diets in children from 6 to 24 mo of age.

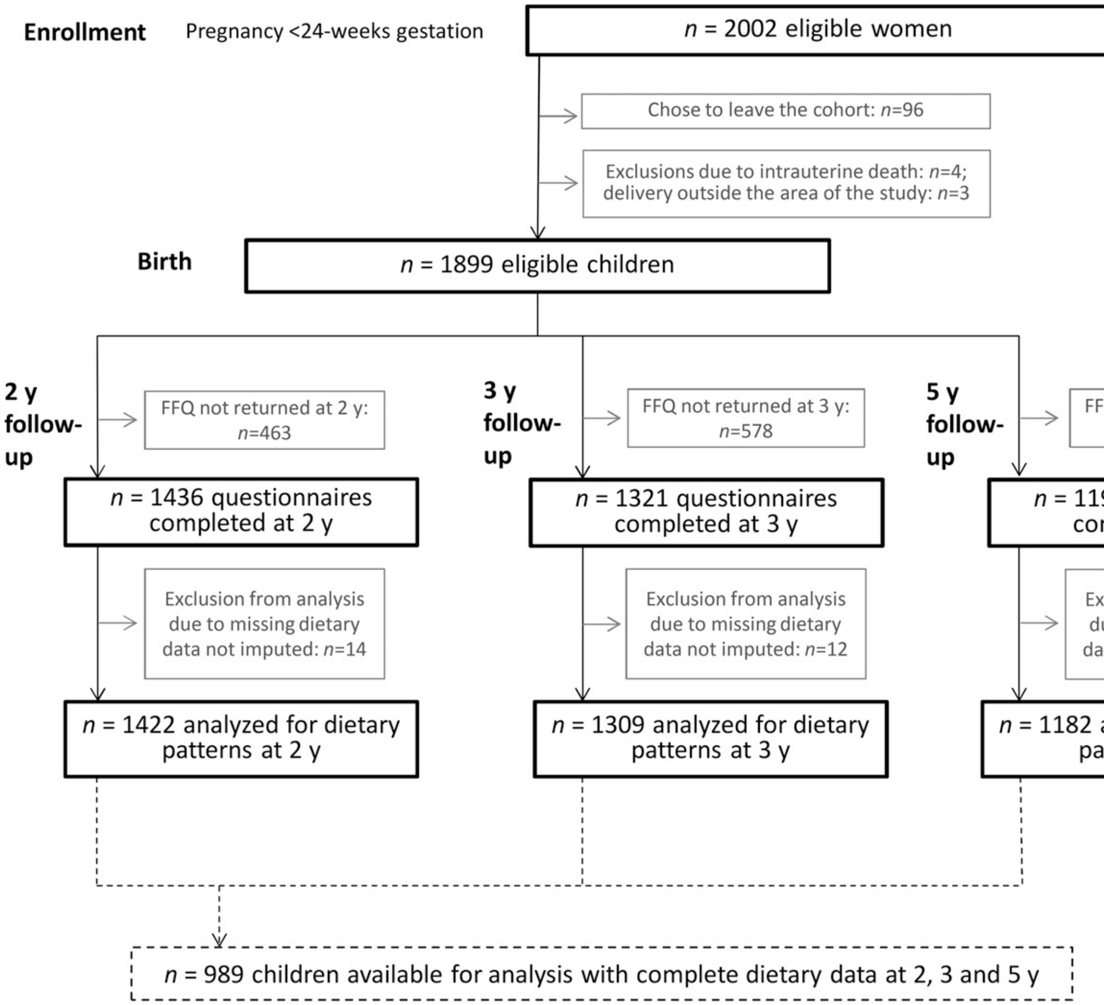

FIGURE 1 Flowchart of study participant selection.

Spearman correlation coefficients and associated P values were estimated between cross-sectional dietary patterns derived at 2, 3, and 5 y of age (n = 989) to assess tracking from ages 2–5 y. Recommendations for interpreting these correlation coefficients are low (<0.3), moderate (0.3–0.6), and high (>0.6) (21).

The associations between each of the cross-sectional dietary patterns identified at age 2 y and the multi–time point dietary patterns (dependent variables) and both the demographic (child age and gender, older siblings at home, and maternal prepregnancy BMI and age at delivery) and socioeconomic (household income and maternal education level) factors were analyzed by means of multivariable linear regression analyses adjusted for recruitment center and season.

The same covariates were included in the multivariable regression analyses undertaken to assess the longitudinal associations between each of the multi–time point dietary patterns (dependent variables) and the 3 infant feeding patterns previously published (15) (n = 660).

The significance level was set at 5%. Values in the text are either percentages or means ± SDs. Analyses were conducted with the use of SAS software (version 9.3).

Results

Characteristics of the study population

Sample characteristics are presented in **Table 1**. Although children excluded from the analysis (because of drop out, exclusion, or missing data) did not differ according to sex, prematurity, or birth weight, they were more likely to be born to younger (28.8 ± 5.1 y vs. 30.2 ± 4.6 y, P = 0.003), single (3.5% vs. 1.0%, P = 0.0002), multiparous (59.4% vs. 52.0%, P = 0.001) mothers. Also, their mothers were less likely to have a university degree (42.4% vs. 61.8%, P < 0.0001) and live in Poitiers (43.4%) vs. Nancy (52.4%; P < 0.0001).

Characteristics of dietary patterns

Cross-sectional approach. Three dietary patterns were identified in toddlers aged 2 y, accounting for 26.8% of the explained variance (**Supplemental Table 1**). The first pattern was positively correlated with intake of French fries, processed meat, carbonated soft drinks, chocolate, chips, cookies, pizza, fruit juice, meat, dairy desserts, and ice cream (by descending order of PCA loadings). We labeled this pattern “Processed and fast foods.” The second pattern, labeled “Guidelines,” was characterized mainly by high consumption frequency of cooked vegetables, rice, fresh fruit, raw vegetables, low-fat fish, potatoes, ham, stewed fruit, and meat. The third pattern had high positive loadings for baby foods, breakfast cereals, and stewed fruit and negative loadings for raw vegetables and fresh fruit. We named this pattern “Baby foods.”

At 3 y of age, 2 dietary patterns were identified with characteristics consistent with those of the first 2 patterns identified 1 y earlier (Supplemental Table 1). These were therefore given the same labels, i.e., “Processed and fast foods” and “Guidelines.” They accounted for 22.0% of the explained variance.

TABLE 1 Characteristics of the sample from the EDEN Study[1]

	Value
Child characteristics	
Male	53.3
Premature birth (<37 wk of amenorrhea)	5.9
Birth weight,[2] g	3295 ± 505
Parental characteristics	
Maternal BMI category[3]	
Thin	7.7
Normal	66.0
Overweight	17.5
Obese	8.9
Maternal age at delivery, y	30.2 ± 4.6
Maternal marital status (single)	1.0
Maternal education	
No diploma	20.8
High school diploma	17.6
2-y university degree	23.9
≥3-y university degree	37.7
Primiparous[4]	48.0
Monthly household income,[5] euros	
<1501	10.2
1501–2300	30.0
2301–3000	30.2
>3000	29.5
Other variables	
Poitiers recruitment center[6]	53.6

[1] Values are means ± SDs or percentages, n = 989, unless otherwise indicated. EDEN, Étude des Déterminants pré- et postnatals précoces du développement et de la santé de l'ENfant.
[2] Mean birth weight was 3231 ± 584 g in the French national perinatal survey performed in 2003 (http://www.drees.sante.gouv.fr/IMG/pdf/enp_2003_rapport_inserm.pdf).
[3] This variable was available for n = 972 children.
[4] This variable was available for n = 987 children.
[5] The median monthly household income in France in 2003 was 2458 euros (http://www.insee.fr/fr/themes/tableau.asp?reg_id = 0&ref_id = NATSOS04202%C2).
[6] The other recruitment center was Nancy.

For children aged 5 y, 2 dietary patterns accounting for 20.8% were derived (Supplemental Table 1). The first pattern was positively associated with a large variety of foods, such as foods of animal origin (ham, meat, processed meat, fish, and eggs), starchy foods (potatoes, rice, legumes, and bread), vegetables (raw and cooked), fresh fruit, and pizza. This pattern was labeled "Protein-rich and diversified." The second pattern, labeled "Processed and fast foods," was mainly characterized by high loadings for chips, carbonated soft drinks, cookies, chocolate, dairy desserts, ice cream, and processed meat, and was inversely related to both cooked and raw vegetables, as well as fresh fruit.

Longitudinal approach. We identified 2 multi–time point dietary patterns spanning 2–5 y, which accounted for 15.0% of the explained variance (**Supplemental Table 2**). We found that these profiles corresponded to consistent exposures to the same food groups across the 3 ages (i.e., 2, 3, and 5 y). We therefore labeled the first pattern "Processed and fast foods at 2, 3, and 5 y" given the repeated exposures to French fries, processed meats, chips, chocolate, carbonated soft drinks, cookies, meat, and fruit juice. The second multi–time point dietary pattern, called "Guidelines at 2, 3, and 5 y," displayed positive loadings at all ages for fresh fruit, vegetables (raw and cooked), low-fat fish, and bread.

Multivariable associations with demographic and socioeconomic factors

At 2 y of age, higher adherence to the "Baby foods" pattern was observed in children born to younger mothers and those with a lower education level (**Table 2**). Conversely, higher maternal education level was related to higher scores on the "Guidelines" pattern. Lower maternal education level, younger age, and the presence of older siblings at home were independently associated with higher adherence to the "Processed and fast foods" dietary pattern. Similar results were obtained with the multi–time point dietary patterns. However, we further found that being a boy or maternal prepregnancy obesity predicted higher scores on the "Processed and fast foods at 2, 3, and 5 y" dietary pattern.

Tracking from infancy to preschool age

Overall, the largest correlation coefficients were observed between similar patterns assessed at different ages, reaching 0.40 and 0.53 for the "Processed and fast foods" and "Guidelines" dietary patterns, respectively (**Table 3**). These correlations were moderate according to our set definition (21). In addition, the "Guidelines" dietary patterns identified at 2 and 3 y of age were both negatively correlated with the "Processed and fast foods" pattern derived at 5 y (correlation coefficients –0.42 and –0.66, respectively). The "Baby food" dietary pattern (age 2 y), however, was correlated to a less healthy diet at later ages (3 and 5 y). Both the "Processed and fast foods" and the "Guidelines" dietary patterns at ages 2 and 3 y correlated positively with the pattern labeled "Protein-rich, diversified" at 5 y of age.

After accounting for all demographic and socioeconomic covariates, our findings showed that the infant feeding pattern called "Longer breastfeeding, later main meal food introduction, and use of homemade foods" (15) predicted respectively lower and higher adherence to the "Processed and fast foods" and "Guidelines" multi–time point dietary patterns (**Table 4**). The reverse was observed with the infant feeding pattern called "Use of prepackaged adult foods." "Later dairy product introduction and use of prepackaged baby foods" predicted lower scores on the multi–time point dietary pattern "Processed and fast foods."

Discussion

To our knowledge, this is the first study in France assessing dietary patterns across toddler and preschool ages. This study provides original insights into the broad international literature on early dietary patterns by accounting for both cross-sectional and longitudinal perspectives.

The previous (15) and current findings from the EDEN cohort suggest the emergence of distinct profiles of feeding practices and food choices early in childhood, consistent with other studies involving infants and toddlers (9, 11, 22–24). Overall, from age 2–5 y, we derived 2 main cross-sectional patterns types that we labeled "Guidelines" and "Processed and fast foods," which correspond to the "Healthy" and "Unhealthy" dietary patterns most often described in children aged 1–5 y, as recently reviewed by Smithers et al. (9). The "Baby food" dietary pattern is close to that derived at age 2 y in a Norwegian population sample (23) and at 6 mo of age in the Southampton Women's Survey, and broadly the reverse of the pattern called "12-mo infant guidelines" in this same cohort (8). The "Protein-rich and diversified" dietary pattern derived at age

TABLE 2 Results of multivariable linear regression analyses from the EDEN study, with cross-sectional dietary patterns at 2 y of age and multi–time point dietary patterns as dependent variables[1]

	Cross-sectional dietary patterns at 2 y of age (n = 1393)			Multi–time point dietary patterns (n = 970)	
	``Processed and fast foods"	``Guidelines"	``Baby foods"	``Processed and fast foods at 2, 3, and 5 y"	``Guidelines at 2, 3, and 5 y"
Sex					
Girls	0	0	0	0	0
Boys	0.03 ± 0.05	−0.10 ± 0.05	0.11 ± 0.05	0.14 ± 0.06	−0.07 ± 0.06
P	0.50	0.06	0.05	0.02	0.28
Older siblings at home					
Yes	0	0	0	0	0
No	−0.29 ± 0.07	0.01 ± 0.07	0.13 ± 0.07	−0.23 ± 0.08	0.03 ± 0.08
P	<0.0001	0.92	0.06	0.003	0.71
Maternal age at delivery, y	−0.14 ± 0.03	−0.01 ± 0.03	−0.09 ± 0.03	−0.12 ± 0.04	0.05 ± 0.04
P	<0.0001	0.78	0.005	0.002	0.22
Maternal BMI category					
Thin	−0.05 ± 0.09	0.13 ± 0.10	0.00 ± 0.10	0.17 ± 0.12	0.22 ± 0.12
Normal	0	0	0	0	0
Overweight	0.11 ± 0.07	0.08 ± 0.07	−0.03 ± 0.07	0.14 ± 0.08	0.01 ± 0.08
Obese	0.09 ± 0.10	0.24 ± 0.10	0.09 ± 0.10	0.29 ± 0.11	0.00 ± 0.11
P	0.30	0.07	0.77	0.02	0.32
Maternal education level					
No diploma	0.53 ± 0.08	−0.47 ± 0.08	0.24 ± 0.08	0.60 ± 0.10	−0.59 ± 0.10
High school diploma	0.27 ± 0.08	−0.27 ± 0.08	0.03 ± 0.08	0.16 ± 0.10	−0.30 ± 0.10
2-y university degree	0.04 ± 0.07	−0.15 ± 0.07	0.04 ± 0.07	0.09 ± 0.08	−0.15 ± 0.08
≥3-y university degree	0	0	0	0	0
P	<0.0001	<0.0001	0.02	<0.0001	<0.0001
Household income, euros					
<1501	0.10 ± 0.10	−0.15 ± 0.11	−0.12 ± 0.11	0.21 ± 0.13	−0.04 ± 0.13
1501–2300	0.07 ± 0.08	−0.01 ± 0.08	0.02 ± 0.08	0.02 ± 0.09	−0.14 ± 0.09
2301–3000	0.01 ± 0.07	0.03 ± 0.07	0.01 ± 0.07	0.04 ± 0.08	−0.06 ± 0.08
>3000	0	0	0	0	0
P	0.69	0.34	0.45	0.35	0.44

[1] Values are linear regression coefficients ± SEs. In addition to the variables listed in this table, models were further adjusted for child age, recruitment center, and season. EDEN, Étude des Déterminants pré- et postnatals précoces du développement et de la santé de l'ENfant.

5 y, which is a mix of both healthy and more protein- and energy-dense foods, has not really been described earlier in young children.

Consistent with other studies, we found that children of less educated (8, 9, 20, 22, 23) and younger (8, 9, 20, 23–25) mothers, and in the presence of an older sibling at home (8, 9, 20, 23), had higher scores on patterns characterized by processed and fast foods, both cross-sectionally at 2 y of age and longitudinally (from 2 to 5 y of age); and that maternal education predicted lower scores on the "Baby foods" pattern at age 2 y (23) and higher adherence to both the cross-sectional and multi–time point "Guidelines" (8, 9, 20, 22, 24) dietary patterns.

Our findings suggested moderate tracking between similar profiles of food intake identified at different ages, with relatively higher tracking when healthier profiles were addressed. This is consistent with other studies involving children aged up to 5 y

TABLE 3 Spearman correlation coefficients and *P* values between cross-sectional dietary patterns scores identified at 2, 3, and 5 y of age in the EDEN study[1]

	Age 3 y		Age 5 y	
Cross-sectional dietary patterns	``Processed and fast foods"	``Guidelines"	``Processed and fast foods"	``Protein-rich and diversified"
Age 2 y				
``Processed and fast foods´´	0.40**	−0.36**	0.35**	0.26**
``Guidelines"	0.26**	0.53**	−0.42**	0.33**
``Baby food"	0.08*	−0.25**	0.26**	−0.03
Age 3 y				
``Processed and fast foods´´			0.13**	0.43**
``Guidelines"			−0.66**	0.16**

[1] n = 989. Recommendations for interpreting these correlation coefficients are as follows: low, <0.3; moderate, 0.3–0.6; and high, >0.6 (21). *$P <$ 0.01, **$P <$ 0.001. EDEN, Étude des Déterminants pré- et postnatals précoces du développement et de la santé de de l'ENfant.

TABLE 4 Results of multivariable linear regression analyses, with multi–time point dietary patterns as dependent variables and infant feeding patterns as independent variables of interest from the EDEN study[1]

Feeding patterns identified over the first year of life[2]	Multi–time point dietary patterns (2 to 5 y)[3]	
	"Processed and fast foods at 2, 3, and 5 y"	"Guidelines at 2, 3, and 5 y"
``Later dairy product introduction and use of prepackaged baby foods"	−0.16 ± 0.04	0.02 ± 0.04
P	<0.0001	0.62
``Longer breastfeeding, later main meal food introduction, and use of homemade foods"	−0.11 ± 0.04	0.29 ± 0.04
P	0.006	<0.0001
``Use of prepackaged adult foods"	0.10 ± 0.04	−0.11 ± 0.04
P	0.006	0.004

[1] Values are linear regression coefficients ± SEs, n = 647. Models were adjusted for demographic (child age and gender, older siblings at home, and maternal prepregnancy BMI and age at delivery) and socioeconomic (household income and maternal education level) factors, recruitment center, and season. EDEN, Étude des Déterminants pré- et postnatals précoces du développement et de la santé de de l'ENfant.
[2] Independent variables (15).
[3] Dependent variables.

(8, 12, 25) or older (26, 27). Complementary crosstabulation analyses (results not shown) indicated that 54% and 48% of the children in the highest tertile of the "Processed and fast foods" dietary pattern at age 2 y remained in the highest tertile of the "Processed and fast foods" patterns at 3 and 5 y of age, respectively. This figure was 57% for the "Guidelines" pattern between 2 and 3 y of age.

Research on tracking has gained interest over the last decade, because it provides insights into the relevance of intervening early through nutritional programs. Beyond the assessment of simple correlations or crosstabulations between dietary patterns identified at different times (8, 12, 25, 28), other tools have been developed to address tracking, such as generalized estimation equations (27) and mixed models (29, 30). These methods were not applied to our data set, because they require that exactly the same variables be measured at different times, which was not the case here, because the questionnaires were adapted to the natural evolution of food intake across the first years of life. The current analysis of tracking confirmed the moderate stability of food choices over this early stage of life, suggesting that children exposed to healthy foods at age 2 y (via adherence to dietary guidelines) are more likely to still be exposed to healthy foods 1 and 3 y later, with the reverse being true for processed and fast foods. Our findings further suggested that healthy food choices at either 2 or 3 y of age predicted lower scores in the "Processed and fast foods" pattern at 5 y of age, as informed by the moderate (–0.42) and strong (–0.66) correlations observed. Consistent and complementary to these findings, crosstabulation analyses (results not shown) indicated that only 18% and 11% of the children in the highest tertiles of the "Guidelines" dietary pattern at ages 2 and 3 y, respectively, were found in the highest tertile of the "Processed and fast foods" pattern at age 5 y.

Although the multi–time point PCA approach was initially undertaken to capture trajectories potentially stable or not, the variability inherent in our data allowed us to derive 2 patterns characterized by repeated exposures to the same foods over time. As such, higher scores for "Processed and fast foods at 2, 3, and 5 y" denoted higher tracking for these types of foods, whereas higher scores for the "Guidelines at 2, 3, and 5 y" pattern could be interpreted as a stable adherence to a diet of high nutritional quality. These 2 patterns are therefore relevant as longitudinal measures of high tracking on either diet.

The use of cross-sectional or multi–time point dietary patterns certainly depends on the research question and hypothesis to be addressed. Whether the issue is to account for total diet at a given point in time, we would advise using all cross-sectional dietary patterns identified at that particular age. In the context of life-course approaches, the multi–time point dietary patterns derived based on the EDEN data are probably relevant when the outcomes (e.g., food preference or obesity) are supposed to be predicted by repeated exposures to and/or the cumulative effect of either healthy or less healthy foods. The derivation of dietary patterns throughout early childhood by combining these 2 complementary approaches, cross-sectional and longitudinal, therefore provided interesting tools for further research based on the EDEN mother–child cohort.

Importantly, although our findings suggested that the "Use of prepackaged adult foods" during infancy predicted unhealthy tracking from 2 to 5 y of age, the feeding pattern closer to infant guidelines "Longer breastfeeding, later main meal food introduction, and use of homemade foods" predicted a diet closer to nutrition guidelines from 2 to 5 y of age. This is consistent with a previous study that showed that breastfeeding and the introduction of complementary feeding after age 4 mo were associated with a positive dietary pattern in year 2 of life (22).

Overall, our longitudinal findings provide comprehensive and dynamic insights into the EDEN dietary data and support the hypothesis that healthy feeding practices during infancy are more likely to track to a healthy diet across toddler and preschool ages. Along with the previous publication based on the EDEN mother–child cohort (15), the current study also confirms that diet is predicted by social determinants at very early stages of life. Infants and toddlers with older siblings and born to younger, less-educated, and overweight mothers are more likely to track on an unhealthy diet and thus appear as a more vulnerable group probably relevant to be targeted through early obesity prevention interventions. Such interventions should involve parents, because they are deeply involved in the setting of feeding practices and the provision of foods to their baby, and they are important role models for their children's dietary intake (31, 32). The presence of older siblings should also be accounted for in such interventions, because their food exposure and/or food preferences toward processed and fast foods are likely to challenge the parent's willingness to follow dietary guidelines (8).

Although women from all sociodemographic positions were recruited at baseline, university-educated mothers were overrepresented in the samples analyzed. This is a typical limitation of cohorts, and it may limit the generalizability of these results. However, it is noteworthy that the robustness of the patterns derived at 2 and 3 y of age was checked by running the PCAs again at these 2 ages in the subsample of 989 children, leading to consistent results; we also reanalyzed the PCAs while excluding children with imputed dietary data, and the PCA loadings remained the same overall (not shown). Further, our results confirmed the social gradient associated with diet that is often reported with maternal education, maternal age, household income, and parity (9), which also argues for the internal validity of the dietary patterns obtained from PCA in the present study. These elements also support the FFQ used, despite the fact that it has not been validated in young children with regard to energy and nutrient intakes. Finally, we acknowledge that in the current study, the follow-up length was only 5 y. During this early stage of life, children's food choices are largely driven by their parents and environment. A future area of research would include examining how these patterns map onto dietary patterns in middle and late childhood when children have more autonomy.

In conclusion, the EDEN data set, with repeated measures of feeding practices and dietary intake from birth to 5 y of age, allowed us to address total diet both cross-sectionally and longitudinally. The current analysis provided us with comprehensive and synthetic variables of total diet and tracking, which will be useful for future research. Our findings confirmed the emergence of dietary profiles socially differentiated early in life as well as a moderate tracking of dietary patterns. Given the growing evidence showing that taste and food preferences are built upon repeated exposures to specific foods (6, 7), our findings should encourage the promotion of healthy feeding practices and healthy dietary trajectories as soon as infancy, in particular among the most socially disadvantaged population groups.

Acknowledgments

We thank the EDEN Mother–Child Cohort Study Group, including: I Annesi-Maesano, JY Bernard, J Botton, MA Charles, P Dargent-Molina, B de Lauzon-Guillain, P Ducimetière, M de Agostini, B Foliguet, A Forhan, X Fritel, A Germa, V Goua, R Hankard, B Heude, M Kaminski, B Larroque, N Lelong, J Lepeule, G Magnin, F Pierre, L Marchand, C Nabet, R Slama, MJ Saurel-Cubizolles, M Schweitzer, and O Thiebaugeorges.

We thank the midwife research assistants, Lorraine Douhaud, Sophie Bedel, Brigitte Lortholary, Sophie Gabriel, Muriel Rogeon, and Monique Malinbaum, for data collection, and the data entry operators, Patricia Lavoine, Josiane Sahuquillo, and Ginette Debotte. SL designed the research, conducted the statistical analysis, interpreted the results, drafted and edited the manuscript, and had primary responsibility for the final content; M-AC and BH designed and led the EDEN mother–child cohort; AB provided the infant feeding pattern scores resulting from a previous study; AF was responsible for EDEN data management; and AB, AF, M-AC, BH, and BdL-G guided the statistical analysis, contributed to the interpretation of results, and edited the manuscript. All authors read and approved the final manuscript.

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