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Socio-economic indicators and diet quality in an older population

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ABSTRACT

Purpose: To examine the strength and independence of associations between three major socio-economic indicators (income, education and occupation) and diet quality (DQ) at baseline and after 20-year follow-up.
Methods: Cross-sectional and longitudinal analyses using data collected in the Rotterdam Study, a prospective population-based cohort. Participants were categorised according to socio-economic indicators (education, occupation and household income) measured at baseline (1989–1993). Participants aged 55 years or older were included (n = 5434). DQ was assessed at baseline (1989–1993) and after 20 years (2009–2011) and quantified using the Dutch Healthy Diet Index, reflecting adherence to the Dutch guidelines for a healthy diet; scores can range from 0 (no adherence) to 80 (optimal adherence). Linear regression models were adjusted for sex, age, smoking status, BMI, physical activity level, total energy intake and mutually adjusted for the other socio-economic indicators.
Results: At baseline, scores on the Dutch Healthy Diet Index were 2.29 points higher for participants with the highest level of education than for those with the lowest level (95%CI = 1.23–3.36); in addition, they were more likely to have a higher DQ at follow-up (β = 3.10, 95%CI = 0.71–5.50), after adjustment for baseline DQ. In contrast, higher income was associated with lower DQ at follow-up (β = −1.92, 95%CI = −3.67, −0.17), whereas occupational status was not associated with DQ at baseline or at follow-up.
Conclusion: In our cohort of Dutch participants, a high level of education was the most pronounced socio-economic indicator of high DQ at baseline and at follow-up. Our results highlight that different socio-economic indicators influence DQ in different ways.

1. Introduction

The prevalence of chronic diseases is associated with socio-economic inequalities [1]. These inequalities may partially be explained by differences in diet quality. Several studies have reported a poorer quality of diet among those in low socio-economic groups than in high socio-economic groups [2,3]. Suggested explanations for these differences include the greater capacity of educated people to understand dietary guidelines and food labels, and the possession of better cooking skills [4,5]. Also, the high price of specific food items such as fruits and fish might play a role [6].

Yet, not all studies report this finding, and the strength of the observed associations differs. Moreover, information specific to older populations is scarce.

Income, education, occupation and wealth are the most commonly studied socio-economic indicators [7]. Often only one socio-economic indicator is used, providing little information on why individuals of low socio-economic status are more likely to report consuming a lower-quality diet. The various socio-economic indicators are conceptually different and as such might influence nutrition and lifestyle via different mechanisms. [7] A higher level of education enables people to understand the complexity of a healthy diet, to understand food labels and to respond better to nutritional interventions [4]. The proposed association between occupation and diet quality can also be explained by social environment and work cultures [8]. Income could influence diet quality because a healthy diet might be more expensive than

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energy-dense, unhealthy foods. [5]

Studies of diet quality usually take into account the totality of diet, including the food items, food groups, and nutrients consumed, their variety, and the frequency at which they are consumed and the quantity [9]. However, most studies use only a single socio-economic indicator or combine indicators to give a single measure of socio-economic status. Despite growing interest in socio-economic inequalities in diet quality, few longitudinal studies have been done [10,12]. Longitudinal studies can assess the effect of socio-economic indicators on changes in diet quality and so, for example, can be used to investigate how people respond to changes in dietary recommendations. This topic is of special interest in relation to older populations, because the ability to meet their nutritional needs may be affected by psychological and physiological factors related to ageing as well as economic and social factors. The Rotterdam Study provides data on three different indicators of socio-economic status. Moreover, the long follow-up of up to 20 years is an advantage, as is the well-defined geographical area of the study population.

Therefore, the first aim of this study is to examine associations between three major socio-economic indicators (income, education and occupation) and diet quality among older people, both at baseline and after a 20-year follow-up.

2. Methods

2.1. Study population

This study was performed in the framework of the Rotterdam Study, an ongoing population-based prospective cohort in Ommoord, a district in Rotterdam, the Netherlands [13]. The rationale for this study was to investigate risk factors for and causes of age-related diseases. Briefly, all residents aged 55+ in the Ommoord district were invited to participate (n = 10,215), and 7983 (78%) joined the first cohort. The Rotterdam Study consists of four different cohorts, of which only the original cohort was used for the current analysis. Participants in the original cohort were examined six times. The current study used data from the first (RS-I-1, 1989-1993, n = 7983) and fifth examinations (RS-I-5, 2009-2011, n = 2147). Home interviews were held to collect data on current health status, use of medication, medical history, lifestyle, and risk factors for chronic diseases. Subsequently, participants visited the research centre for extensive clinical examination and dietary assessment. Every 2–4 years participants were invited for a follow-up visit. Full details of the study are given elsewhere [13].

2.2. Socio-economic indicators

At baseline (1989–1993) education, occupation and household income were measured using questionnaires. Annual household income (in guilders) was reported as falling within one of 13 categories, which in the present analyses were collapsed into four categories: < 28000, 28000–39999, 40000–54999, > 54999 guilders. The guilder was the Dutch national currency at baseline of the Rotterdam Study, i.e. when the data on income were collected, and 1 guilder corresponded to 2.20 euros. Education was also recorded in four categories: primary education with or without partially completed higher education; lower vocational or lower secondary education; intermediate vocational education and general secondary; and higher vocational or university education. Current or last occupation was categorized into five groups: routine non-manual employees in administration and commerce; lower-grade professionals; higher-grade professionals; small proprietors; and manual workers. Women who indicated they had full-time domestic responsibilities were categorized as “full-time caregivers”.

2.3. Assessment of dietary intake and diet quality

At baseline, dietary intake was assessed using a validated food frequency questionnaire (FFQ) in a two-stage approach. First, participants completed a self-administered checklist of 170 food items in which they identified foods they had consumed at least twice a month in the preceding year, forming a basis for the second stage, in which a trained dietician collected data on the frequencies and amounts of the foods [14]. From the full cohort at baseline (n = 7983), 5434 participants had reliable dietary data. At follow-up (RS-I-5), to take into account changes in dietary pattern consumption, an FFQ based on 389 items was used [15,16]. From the full RS-I-5 cohort (n = 2140), 1441 completed an FFQ. Nutrient data were calculated from the Dutch Food Composition Table. Information from the FFQ was used to estimate diet quality using the Dutch Healthy Diet Index (DHDI), developed by van Lee et al. [17], which reflects adherence to the Dutch Guidelines for a Healthy Diet (2006). Briefly, we included eight components (vegetables, fruit, fibre, fish, saturated fat, trans-fat, sodium and alcohol), each with a score ranging between zero and ten, where ten indicates that a participant meets the Dutch recommendations or has an optimal intake. A total DHDI score is calculated by adding all component scores together, resulting a score between zero (no adherence to recommendations) and 80 (complete adherence to recommendations). Details regarding the validation of the FFQs, the included food groups and the cut-offs used to compose the DHDI are provided in Supplemental Table 1. Diet quality was assumed to be “stable” over time if participants were in the same quartile of diet quality at follow-up as they were at baseline.

2.4. Assessment of possible confounders

At baseline, weight (kg) and height (cm) were measured at the research centre, and BMI (kg/m^2) was calculated and categorized according to the WHO criteria for overweight (25 < BMI < 30) and obese (BMI > 30). Cigarette smoking status was collected through self-report. Physical activity levels were assessed with an adapted version of the Zutphen Physical Activity Questionnaire [18]. To quantify the level of physical activity, we used the metabolic equivalent of task (MET). We assigned MET values to all activities mentioned in the questionnaire, according to the 2011 updated version of the Compendium of Physical Activities [19,20]. Subsequently, MET values were subdivided into population-specific tertiles. Household composition was defined as living with a partner, alone or with a person other than a partner. “Diseased” was defined as being hospitalized in the past year (regardless of the nature of the hospitalization), as having experienced a heart attack with admission during the past year, or being diabetic at entry to the study.

2.5. Statistical analyses

Education and income were analysed using dummy variables with the lowest groups as reference. Most participants’ current or last occupation was as a ‘routine non-manual employee in administration and commerce’, and this was used as the reference group for occupation. The correlation between DHDI score at baseline and follow-up was calculated with the Pearson correlation coefficient. Overall stability of the diet was estimated by calculating the percentage of participants who remained within the same energy-adjusted quartile of the DHDI. Additionally, stability was assessed for each item of the DHDI.

Three multivariate, cross-sectional, linear regression models were created: each socio-economic indicator as exposure and DHDI score as outcome, adjusted for age and gender (model 1), additionally adjusted for baseline characteristics (smoking, physical activity, living situation and BMI) and total energy intake (model 2), and additionally adjusted for the other socio-economic indicators (occupation, income, education) (model 3).

The same three models were created for the longitudinal analysis, using diet quality at RS-I-5 as the outcome and an additional adjustment for diet quality at baseline. If significant longitudinal associations