

# Changing eating practices after midlife: Ageing and food consumption in the French Gazel cohort

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**Abstract:** *Understanding not only differences in consumption but differences in how consumption changes presents a theoretical and empirical challenge. In this article, we draw on theories of practice, a life-course perspective and approaches in terms of tastes or dispositions to examine how food consumption changed after midlife in a large cohort of French adults aged from 50 to 75 years. We have been able to present a bird's eye view of these practices, thanks to multiple correspondence analysis and a micro-level analysis of how individuals changed their food consumption as they aged, thanks to regression models. The first step summarised food consumption data into three modes of engagement with eating, related to prescriptions from the food market (eating as convenience), nutrition (health) and French cuisine (tradition). The second allowed us to examine how modes of engagement with eating were associated with individual characteristics (being a woman, having higher education), ageing and characteristics of participants' living arrangements (living with children and/or a partner). In conclusion, the sociology of consumption may benefit from taking stock of both dispositional and contextual perspectives on the differences and dynamics of practice. Developing adequate methods, as we do here, is a promising way forward.*

**Keywords** *prescriptions, nutrition, gender, dispositions, theories of practice, life-course, eating, France, household, modes of engagement, Gazel, cohort, multiple correspondence analysis (MCA)*

## Introduction

How does food consumption change as people age? Do they stick to habits acquired earlier in life, or do they adapt constantly to new circumstances, food supply or recommendations? Do eating practices become increasingly similar or heterogeneous as people get older? Addressing these questions, this article builds both on the sociology of taste and theories of practice to explore changes in consumption and differences in such changes. While the first maps differences in consumption with social position and identities through concepts such as habitus, taste or dispositions (Atkinson & Deeming, 2015; Bourdieu, 1984; Flemmen et al., 2018; Lahire, 2020), the second examines the variability or inertia of performances across individuals and over time with notions such as routines, arrangements and bundles of practices (House, 2019; Paddock, 2017a; Schatzki, 2002; Warde, 2014, 2016). We think both theoretical perspectives are necessary to account for changes in consumption. Considering that praxeological studies of consumption are overwhelmingly qualitative (Halkier, 2017), our contribution is also to provide new sociological perspectives for quantitative studies of eating practices.

Thanks to data from Gazel, a large French epidemiological cohort, we were able to examine the food consumption of 10,000 French adults aged from 50 to 75 years. A multiple correspondence analysis (MCA) of the foods consumed revealed three modes of engagement in eating: convenience; health; and tradition. These were very stable over time: as participants aged, they moved in this three-dimensional space but the dimensions themselves did not change. Men engaged more in eating as convenience or tradition, while women and the more educated participants generally engaged more with eating as health. As participants aged, they moved slightly away from eating as convenience and engaged more with eating as health or tradition. The more educated participants changed faster and the differences between men and women declined. Changes in living arrangements, such as the loss of a partner or children leaving the family home, also affected eating, confirming that context and other practices play a major role, especially in eating as convenience.

In the first section, we outline our theoretical framework, arguing that the sociology of eating practices has developed at the cost of ignoring differences in consumption that align with social identities (such as class or gender). In the second section, we introduce our empirical material, the Gazel cohort, and discuss how we analysed it. In the third section, we introduce the results from our multiple correspondence analysis, and comment on three modes of engagement in eating that persist over time. In the fourth section, we examine whether people engage differently with eating across gender and educational level and as they age, by modelling how men and women moved

around in the three-dimensional space generated by the MCA. We also discuss whether age-related changes differ across education and gender, and how living arrangements modify engagements with eating. In the last section, we underscore our contribution in two respects: how data on individual performances help to describe the teleo-affective structure of a practice; and how patterns and dynamics in practices relate to social identities and, ultimately, social stratification.

## Theoretical framework

Accounting for change in a sociologically relevant way is a challenge for many theories (Abbott, 2016). The way scholars address change at the individual level (the topic of this article) is often related to assumptions regarding agency. The theoretical approaches used in the field of consumption research are no exception. Individualist approaches (such as behaviourist frameworks and part of the postmodern or culturalist research reviewed by Warde, 2014) often assume that individual agency provides a self-sufficient explanation of changes in consumption (Warde, 2014). Research inspired by the work of Bourdieu, in contrast, assumes that individual agency is framed by tastes or dispositions that persist over time (Warde, 2017, p. 116). Some scholars have examined how a person's dispositions might change, but this seems to happen only in very specific circumstances (Darmon, 2012, 2018). Lahire (2020) labels these approaches 'dispositionalist'.

Practice theories are much more 'contextualist' in Lahire's (2020) terms. Considering individuals as carriers of practices, these theories shift the focus from individuals to practices and the arrangements<sup>1</sup> that prefigure them. Arrangements designate the context relevant to a practice: things, space, people and the relations between them, timing and so on. The 'endless becoming' of the social world (Schatzki, 2002), or the 'dynamics of social practices' (Shove et al., 2012) are repeatedly and recursively enacted. People do not necessarily perceive change in their everyday practices (Wahlen, 2011). Sources of practice change could be the internal dynamics of practices (as with the normalisation of frozen foods, Shove & Southerton, 2000); the strategies of organised actors who compete to shape practices in order to advance their agenda (Blue et al., 2016 use the example of public health campaigns against tobacco consumption); or changes in bodies, materials or arrangements required by practices (Truninger, 2011 examined cooking with a new appliance). Changes in other, related practices also play a role: Jackson et al. (2018) show how the process of

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<sup>1</sup> Schatzki (2002) distinguishes between orders and arrangements. For the sake of simplicity, and because we describe them very generally, we use the term 'arrangements'.

'conveniencization' of food relates to the interplay of food practices such as purchase, cooking and disposal of food, but also to other practices such as paid work.

Sociologists using theories of practice have increasingly scrutinised the life-course and life-course events to account for changes in eating practices. Plessz et al. (2016) demonstrate that along the life-course, some turning points may be highlighted, where people tend to reconfigure their resources and constraints. Their sensitiveness to recommendations, such as nutritional and environmental norms relating to food, increases, which might entail changes in practices. Burningham and Venn (2020), focusing on transitions such as the birth of a child and retirement, insist on the continuous nature of change and challenge the notion of turning points, since the changes occur as processes and may be reversible; they also insist that individual transitions need to be analysed within their surrounding context, primarily the household dynamic. Paddock (2017a) uses the concept of nexus to show how food practices are embedded within a stable structure engaging other related practices (work, leisure and so on). Changes in those related practices due to life-course events (moving, change in household structure) can unlock the nexus and open the way for changes in food practices. Gojard and Véron (2018) also insist on the relatedness of food practices (shopping, cooking, storing) and life circumstances in favouring the adoption of one or another pattern of food practices. This may happen in the long run or even in the short term – for instance, during holidays with a change in location, the provisioning system and the daily rhythm of life (Gojard & Véron, 2019). Studying the adoption of novel foods based on insects, House (2019) proposes the notion of phased routinisation as a conceptual tool to tackle the transition between one mode of eating and another.

Much of this research more or less explicitly recognises that, while eating practices are varied and change over time, they are also patterned: House (2019) identified 'modes of eating', Gojard and Véron (2018) found 'patterns' and Halkier (2009) detected 'cooking styles', whereas Paddock (2017a) insists on 'sets of routines'. Those different framings reveal that there is no one unique and proper way of performing food practices, but rather different ways, each adapted to the relevant social and material context.

Alan Warde (2016) argues that the multiple definitions of proper eating are indicative of a weak formalisation of the practice of eating, which he sees as a compound practice (Warde, 2013, 2016). Eating is composed of different elementary practices, each with its own codification. Eating appears to encompass a great number of activities, from food shopping to cooking and organizing proper meals. A variety of social actors (including firms, organisations, social movements, professions) are

involved in framing these practices, from the material and mundane to the symbolic or moral dimensions. The fact that they compete to disseminate their own views in the public space may account for the patterns found in performances of and engagements with eating. Interestingly, Warde's argument focuses on the diversity of producers and prescriptors, rather than consumers and households. Yet practices need people to perform them. It seems difficult for sociologists to avoid asking *which* people perform them, or engage in them in a specific way.

While emphasizing the variety of the performances of eating across individuals and over time, this line of research seldom examines whether individuals who adopt similar practices, engage with them in similar ways or resort to similar procedures share common traits such as gender, social class, migrant status or age-group. Addressing this question, Southerton (2006), found modes of engagement typical of middle-class practitioners (see also Plessz & Gojard, 2015). Warde et al. (2020, p. 392), studying domestic hospitality in the United Kingdom, found that, 'People hosting friends in 2015 tend to be women, cohabiting, white British, with higher education qualifications, and service class connections.' From a praxeological perspective, identifying modes of engagement typical of men versus women, for example, remains a meaningful purpose, since theories of practices assume that practices express and perform identities, both to practitioners themselves and to others (Pred, 1981; Shove et al., 2012, pp. 78–79) – and recursively shape the teleo-affective structures of the practices. In addition, when it comes to food consumption, differences across social groups matter when addressing issues such as environmental justice and social sustainability, the social gradient in health or political consumption.

Indeed, researchers using theories of practices have already started to investigate how social characteristics are associated with the performance of and engagement with eating practices. Plessz and Gojard (2014), for instance, dealing with vegetable consumption, have shown that the consumption of fresh vegetables is linked to a higher education, revealing an engagement in the practice orientated towards the fulfilment of nutritional prescriptions, which can also be considered a distinctive mode of eating. Sociologists of food and eating more inspired by Bourdieu have addressed this point more systematically: in *Distinction*, Bourdieu (1984) matches tastes with social class, initiating a long series of research studies on the social stratification of tastes. Atkinson and Deeming (2015) and Flemmen and Hjellbrekke (2016) debated social class and tastes expressed by cooking (see also Flemmen et al., 2018). Lhuissier (2012), studying obese working-class women, and Darmon (2018), conducting an ethnography of anorexic middle-class teenagers, found that

engagements with weight and dieting differed according to dispositions previously acquired during childhood or at work.

Unfortunately, this line of research seldom explores the variations of eating practices and engagements over time. The studies are often static (Atkinson, Flemmen and their coauthors) or they focus on how people have come to adopt the practices they perform at the time of the study (as in Darmon 2018). There are exceptions, such as Warde's (1997) analysis of how the antinomies of taste changed in Britain, or the trends in French eating revealed by Grignon and Grignon (1999). Plessz and Guéguen (2017) have examined how union break-up changed vegetable consumption according to gender and education in the Gazel cohort.

The literature on ageing and eating supports the need to study together the differences in eating across individual characteristics such as gender, class or education, and the dynamics of eating over the life-course. Indeed, the food consumed varies strongly across age groups, with older adults eating more in line with dietary recommendations in France (Malon et al., 2010) and in the United States (Krebs-Smith et al., 2010). When studying fresh vegetable consumption, Plessz and Gojard (2015) found its association with age-category was even stronger than education or income level. Yet, among the over-sixties, eating differs according to class, gender, education level, family situation (Escalon & Beck, 2010; Fraser et al., 2000; Host et al., 2016; Irz et al., 2014) and age (Maître et al., 2021). Moreover, a number of contextual changes occur during ageing that can disrupt eating practices: children leave the parental home, with consequences for the amount of food consumed and the composition of meals (Neulinger & Simon, 2011; Plessz et al., 2016). Retired people eat more meals at home (Hurd & Rohwedder, 2006; Stancanelli & Soest, 2012). After retirement, men therefore more often eat meals prepared by their spouse or a carer (Cardon, 2015; Plessz & Guéguen, 2017), which could bring men's diets closer to those of women. Women, more often than men, experience the loss of their partner and consequently widowhood (Arber, 2004).

This article therefore aims to grasp both the 'dispositional' and the 'contextual' factors that may influence eating as people age. We use a large prospective cohort of French adults who were followed for 16 years after midlife. We focus on two individual characteristics that generally do not change with age (gender and educational level) and two aspects of living arrangements (living with a partner and with at least one child) that may change over time. In order to examine differences (across participants), changes (over age) and differences in changes, we start by building a tool allowing the comparison of eating across participants and over time thanks to multiple correspondence analysis (MCA).

## Materials and methods: Changing modes of eating in the Gazel cohort

Many types of empirical materials allow to study changes at the micro level, including personal archives, diaries (Wahlen, 2011), retrospective interviews (Paddock, 2017b), repeated interviews (Burningham & Venn, 2020) and prospective cohort data. Life-course sociology makes good use of retrospective data collection (both through survey questionnaires and biographical, qualitative interviews). This is suitable for biographical events and institutionalised status such as being married or in employment, but much less adequate when the topic is mundane everyday consumption, which people hardly ever remember in detail after several years. This is the case for food consumption, but also for many forms of cultural consumption, such as watching TV, reading magazines or listening to the radio. Prospective data collection, in which individuals are followed-up after the time of inclusion in the study, is a more suitable option for such topics. In Burningham and Venn's (2017) qualitative study, 80 respondents who were expecting a child or had retired were interviewed three times over eight months. Scaling-up to several thousands of participants and several years of follow-up requires amounts of funding seldom available in the social sciences. In order to investigate food consumption, we took advantage of a large prospective cohort whose principal investigators are epidemiologists.

### **The Gazel cohort**

Gazel is a prospective epidemiological cohort. In 1989, all employees of the state-owned energy companies *Électricité de France* (EDF) and *Gaz de France* (GDF) aged between 40 and 50 (35–50 for women) were invited to participate in the study. Half of them completed the first questionnaire and were included in the cohort (20,625 participants). The yearly follow-up included a paper questionnaire sent out by mail. Death and cancer registries, the national health insurance system (SNIIR-AM) and company services (occupational medicine, human resources and pension funds) provided additional data, including updated postal addresses for the participants.

Gazel participants are not representative of the 1990 French population, nor even of the French working population, because they are all members of the same birth cohorts and because of the specificities of the workforce in the energy industries. The cohort includes only 5,614 women (27 per cent of participants) because the energy sector is very masculine. The participants belong to the privileged birth cohorts identified by Louis Chauvel in France (Chauvel, 1998; Chauvel & Schröder, 2015), and as employees of state-owned companies they had specific employment statutes ensuring

job security, seniority-based promotion and attractive pensions (Cartier et al., 2010).<sup>2</sup> They have thus benefited from educational expansion, economic growth, very continuous careers and early retirement (between 55 and 60 years of age). Finally, women out of the labour force were not sampled.

Without being a general population survey, the Gazel cohort is based on systematic invitations. Moreover, Gazel participants were recruited at all occupational levels in EDF and GDF companies, among routine manual (mostly male) and non-manual (mostly female) workers, and middle- and (mostly male) top-managers. The proportion of tertiary educated was similar in Gazel and in the French employed population of the same birth cohort (Dion et al., 2020).

In order to study changes, bias in time-trends is a major pitfall. Attrition is relatively limited in the cohort. Out of the 20,625 participants in 1989, only 520 were excluded from the cohort (because they asked to be, or because they quit the company before retiring) and another 1,974 died before 2014, resulting in an attrition rate of 12 per cent. The response rate to each yearly follow-up questionnaire was around 80 per cent (Goldberg et al., 2007).

## **Methods**

### ***Main variables***

Food is a recurrent but minor theme in the cohort questionnaires. This avoids recruitment bias on interest in nutrition. In 1998, 2004, 2009 and 2014, the same qualitative food frequency questionnaire was introduced by the question ‘How many times a week do you eat (including meals and snacks) ... food groups such as: eggs or fried foods (chips, crisps, doughnuts, breaded meat or fish, etc.)?’ Available answers were: ‘never or almost never’; ‘once or twice a week’; ‘not every day but more than twice a week’; ‘every day or almost every day’. Some items had rare modalities (chosen by less than 5 per cent of the sample), which we grouped with the adjacent modality (e.g. for bread ‘never or almost never’ with ‘once or twice a week’). In addition, we used questions on salt, sugar, low-fat products, fats and alcohol consumption. (See Appendix A3 for the list of the 22 food items and the additional questions.)

We defined educational levels consistently with the French educational system and participants’ birth cohort. Primary education refers to people who quit school before the age of 15 (21.2 per cent

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<sup>2</sup> Only workers hired as ‘agents’ (as opposed to fixed-term contracts) were sampled. At the time of the survey, French nationality was required. Since 2004, EDF-GDF is no longer a state-owned company. Workers hired after 2004 have regular labour contracts.

of the study population), with primary or lower secondary education (*collège, BEPC*). Secondary education (50.4 per cent of the study population) refers to people who received some secondary education. They may have obtained a secondary vocational diploma (*Baccalauréat professionnel, Brevet d'études professionnelles*). Finally, 28.4 per cent had tertiary education (including the *Baccalauréat*, the end-of-secondary education exam which is required for tertiary education). The other variables of interest describe the household structure: every year, respondents were asked whether they lived with a partner and with one or more children. Lastly, there were two birth cohorts for men (1938–43, 1944–48) and a third for women only (1949–53).

### ***Non-responses and study population***

In order to avoid attrition bias, we selected the 10,425 participants who were still alive in 2014 and had returned the 1998, 2004, 2009 or 2014 questionnaires and completed at least eight of the 22 food frequency questions. Descriptive statistics comparing the 20,625 cohort participants to the 10,425 participants selected for this study appear in Appendix A1: our study population has a slightly higher educational level than the whole cohort. Education, birth year and sex had no missing values. Missing values for food questions were replaced by the most frequent answer of participants of the same age, sex, partnership status and education. Missing values for living with child or partner in a given year were replaced by the last valid answer.

While we wanted to avoid bias due to attrition, mortality can also be a confounding factor because food consumption contributes to health and longevity. So we also estimated the MCA and models on all available cases, provided that they completed the 1998 questionnaire. Results (available on request) were very similar to those presented here.

**Table 1: Inertia and list of the most contributing modalities for the first three dimensions of the Multiple Correspondence Analysis**

Dimension	Inertia	Strongest contributions		The higher the score, the more <sup>3</sup> ...	Mode of engagement with eating
		Negative coordinates	Positive coordinates		
1	5.17%	Cold cuts never or almost never Fried foods never or almost never Sugar never or almost never Meat <sup>1</sup> less than 3 times/week Dessert never or almost never Vegetables almost every day	Cold cuts at least 1/week Fried foods at least 1/week Sweetened drink at least 1/week Carbs less than 3 times/week Pastries at least 1/week	Fat and sweet products, processed foods	<b>Convenience</b>
2	4.19%	Raw vegetables less than 3 times/week Fruit never or almost never Vegetables less than once a week Dairy never or almost never Fish never or almost never	Cooked vegetables almost every day Raw vegetables almost every day Dairy almost every day Fruit almost every day	Fruit, vegetables, dairy	<b>Health</b>
3	3.89%	Bread not every day Dairy more than twice a week Milk 1 to 5 times a week Light more than twice a week	Dairy never or almost never Wine 3 glasses/day or more Meat almost every day Carbs almost every day Cheese almost every day 'Diet' <sup>2</sup> foods never/ almost never Vegetables (raw) > 4 times a week Vegetables almost every day Cold cuts more than 2/week	Meat, wine, cheese	<b>Tradition</b>

<sup>1</sup> Meat: red meat (another item concerns poultry).

<sup>2</sup> 'Diet': low-fat or low-sugar (*allégé* or *light* in French).

<sup>3</sup> We multiplied coordinates by (-100) for better readability.

### **Statistical analyses**

In order to focus on the sociological content, here we outline the method and its sociological rationale. In Appendix A2, we provide a more detailed and technical version of this section, with all the relevant information.

In order to identify *modes of engagement in eating*, we performed a multiple correspondence analysis (MCA). Sociologists have extensively used MCAs to identify patterns in tastes or lifestyles. Connecting such patterns of consumption to positions in the social space is common in studies of social stratification and consumption (Bourdieu, 1984; Chan, 2010; Flemmen et al., 2018;

Tomlinson, 2003). From a praxeological perspective, an MCA carried out on the foods consumed may reveal different modes of engagement with the practice of eating. Such modes of engagement may relate to definitions of proper eating that circulate in a society under the forms of recommendations, advertisement or social norms regarding a proper meal (see Plessz et al., 2016). The results of the MCA in 1998 are summarised in Table 1 and detailed in Appendix A4.

In order to capture *changes in individuals' modes of eating*, we calculated the coordinates of each individual on the three dimensions of the MCA, based on their answers to the 2004, 2009 and 2014 questionnaires (as in Coulangeon, 2013; Müller-Schneider, 1994). In Appendix A5, a graph gives an example of how a randomly chosen participant moved in this three-dimensional space.

In order to check *whether the three modes of engagement in eating were stable over time*, we examined whether the different MCAs for each year (1998, 2004, 2009, 2014) generated similar dimensions. We ran those analyses and calculated the correlations of the individual coordinates in 1998 and in the following years (more detail in Appendix A2, results in Appendix A6).

In order to model *changes in modes of eating*, we ran regressions with a random intercept. The dependent variables were the coordinates on the three dimensions of the 1998 MCA. Education and birth cohort were time-independent covariates. Age was treated as a continuous variable and the estimation was restricted to ages 50 to 75 years. Birth cohort was added as a control variable because Gazel included only women in the 1943–48 birth cohort.

In order to examine *differences in ageing* across gender and educational level, we ran separate models for men and women. This was necessary because, in the Gazel cohort, women born in 1949–1953 had no male counterparts. We were interested in whether more educated participants aged differently, so we added an interaction between age and education. In a study on the evolution of alcohol consumption, Holdsworth et al. (2017) show that life-course transitions have different effects according to gender. We then maintained the distinction between men and women.

## From food consumption to modes of engagements with eating

From the 22 food consumption variables in 1998, the MCA extracts a three-dimensional space, in which each dimension can be seen as a mode of engagement with eating. We also found that these

three modes of eating robustly accounted for patterns of food consumption in the study population from 1998 to 2014<sup>3</sup>.

### **Three modes of engagement in eating**

The first three dimensions from the MCA of food consumption (see screeplot in Appendix A4) exhibited consumption patterns consistent with prescriptions disseminated by different actors involved in food and eating. The first dimension captured the processed foods promoted by the agroindustry; the second was characterised by the consumption of foods considered as healthy by public health recommendations (World Health Organization, 2020); the third related to lay rules inherited from a bourgeois domestic appropriation of gastronomic menus (Csergo, 2016; Marengo, 1992). We named them eating as *convenience*, *health* and *tradition*, respectively.

- *Convenience*. The first dimension contrasts participants who frequently eat fat and sweet products (fried food, cold cuts, pastries, sugar, sweetened drinks, desserts, etc.) (positive coordinates) with low consumers of these products. Foods that contribute to this axis are often industrially processed. This dimension could be compared with the Western dietary pattern often isolated by nutritionists (Kant, 2004). We interpret this dimension as a mode of engagement that relates to definitions of proper eating disseminated by market players in the agri-food sector – for example, through advertising. We label it *convenience* despite the multiple meanings of the word, since convenience is often an argument put forward by market actors (Jackson et al. 2018).
- *Health*. The second dimension contrasts the high consumers of fruit, vegetables, dairy products and low-fat products (positive coordinates) with the low consumers of these products and fish (negative coordinates). Positive coordinates identify what nutritionists call a ‘healthy’ diet. The contribution of dairy products is relevant because French nutritional prescriptions for ageing people recommend a higher consumption of dairy products. We therefore interpret this dimension as reflecting the definition of proper eating disseminated by public health and nutrition, in a version that makes sense for middle-aged Gazel participants.
- *Tradition*. The third dimension isolates (on the positive side of the axis) participants who often consume red meat, wine, cheese, vegetables and bread, but seldom eat fruit, low-fat

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<sup>3</sup> Those three dimensions remain unchanged when we perform the same analysis on all the available cases in 1998, including those who did not survive.

products and dairy products. This dimension refers to products of traditional French cuisine. They may be processed (wine, cheese and bread are seldom home-made), but have long been part of French cuisine, as opposed to dairy or low-fat products, which the food industries have developed over the last few decades. Wine contributes to this dimension, a signal of French alcohol consumption patterns: among the generations that constitute the Gazel cohort, people often drink wine with a meal (Beck et al., 2008). This dimension therefore reflects a definition of proper eating that may be supported by the catering industry, cookbooks and TV cooking shows, as well as by family relationships. It is related to the 'gastronomical meal of the French', which was inscribed on the Representative List of the Intangible Cultural Heritage of Humanity in 2010 (Csergo, 2016; UNESCO, 2010). This definition does not exhaust gastronomical definitions of proper eating, but it has made its way into the daily practices of a significant part of our sample. Some households may perform it only on special occasions or family reunions, others on a more regular basis – especially among middle-class older generations.

We can relate our results to three of the four components identified by Warde (2013) when describing eating as a compound practice: our first dimension relates to shopping as structured by market actors, our second to cooking as structured by public health, our third to the judgement of taste in line with French cuisine. According to Warde, the components are contingent with the national and historical context – indeed, the definitions of eating as convenience, health and tradition exhibited by consumption patterns in the Gazel cohort are consistent with the French context in the late 1990, for people aged in their fifties or sixties. Warde identified a fourth component, the social organization of meals (e.g. table manners). Our food frequency questionnaires do not provide descriptions of meal organization; however, they allow us to examine how practitioners changed their food consumption as they aged, by analysing the data from 1998 to 2014.

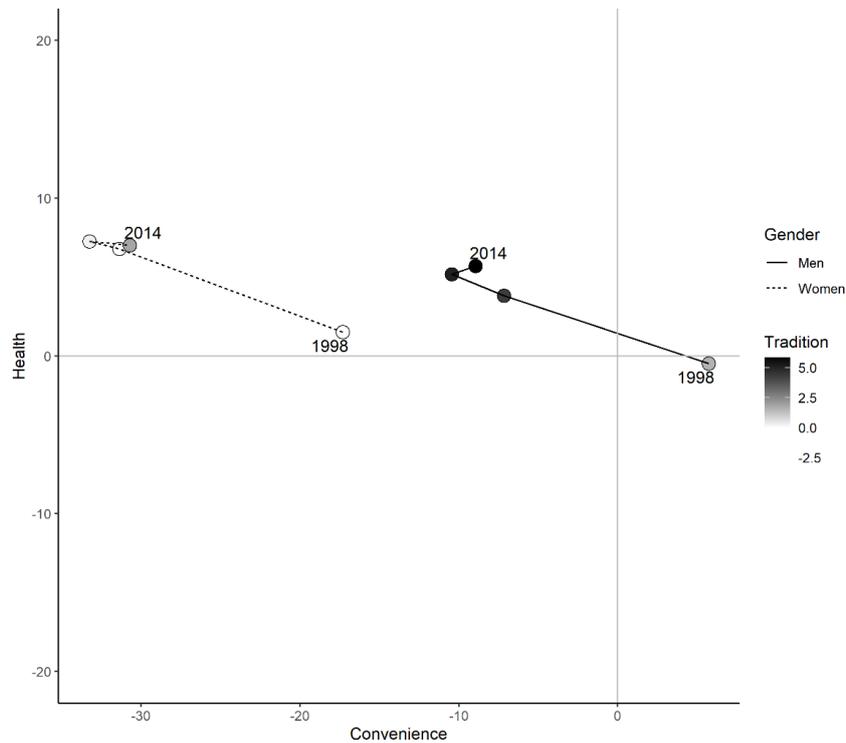
### **A space that is stable over time**

Before we examine how people move in this three-dimensional space, a major question is whether the three dimensions are stable over the 16 years of follow-up. Indeed, a conundrum for any quantitative analysis of change is that, in order to measure change, we need time-invariant measurements.

When we ran MCAs on each of the follow-up food questionnaires, we found that dimension inertia and variable contributions changed little. We examined the correlations between the participants' coordinates in the 1998 three-dimensional space, based on their answers to the follow-up food questionnaires, and the coordinates we found when we ran a different MCA on each of these questionnaires (Appendix A6). We found very high correlation coefficients: the lowest were for axis 3 in 2009 and 2014 (0.87 and 0.85 respectively); the others were above 0.93. This indicates that, while individuals moved along the three dimensions of eating, the three dimensions themselves were remarkably stable. On a given year, food consumption in the Gazel cohort remained patterned by similar oppositions and similarities.

This allows us to describe how Gazel participants' modes of engagement with food changed as they aged. We can trace each of them in the three-dimensional space constituted by the MCA. In Appendix A5, we did it for participant #48100034, a man aged 54 in 1998. Figure 1 shows the average position of men and women on each of the food-questionnaire year. In 2014, men and women scored higher on the health and tradition dimensions and lower on convenience. Men scored higher on tradition and convenience; however, this first view is blurred by the fact that, on a given year, men's age can be 10 years apart (15 for women). Also, many aspects of participants' lives may have changed as they lived through the 16 years. This calls for more refined models, explored in the next section.

We can model the path participants have followed according to their own characteristics and changes in their living arrangements.



Note: average coordinates of men and women on the three dimensions of the 1998 MCA, according to year of food questionnaire.

**Figure 1: tracing men’s and women’s engagements with food over time in Gazel**

## Differences, changes and differences in changes

In this section, we examine how modes of engagements in eating vary across practitioners (depending on their gender and education) and as practitioners aged<sup>4</sup>. We examine whether people engage differently with eating as they age, and across gender and educational level, by modelling food consumption of men and women from 50 to 75 years old. We then turn to living circumstances, understood as arrangements that prefigure eating, with a focus on living with a partner and children. Table 2 displays the results of the models and Figure 2 shows predicted values according to age, gender and education, in order to facilitate the interpretation of the coefficients.

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<sup>4</sup> Despite our focus on ageing, this research has little to do with attempts at decomposing changes in age, period and cohort effects. Indeed, all respondents were born during a period of 10 years (15 for women). Most importantly, we are analysing panel data (repeated survey on same participants) whereas age-period-cohort models are designed to make the best of pseudo-panels (repeated survey on different participants).

**Table 2:** Changes in eating over age and across sex and educational level (random-intercept linear regression)

		Men			Women		
		Dim. 1	Dim. 2	Dim. 3	Dim. 1	Dim. 2	Dim. 3
		<i>Convenience</i>	<i>Health</i>	<i>Tradition</i>	<i>Convenience</i>	<i>Health</i>	<i>Tradition</i>
<b>Age</b>	(Per year)	-0.80***	0.39***	0.23***	-0.55***	0.25***	0.29***
<b>Education</b>	Primary (ref)						
	Secondary	1.71*	4.32***	-1.46*	-0.52	2.11	0.080
	Tertiary	-1.45	4.50***	-3.54***	-0.57	3.13*	-1.05
<b>Interaction</b>	Secondary # Age	-0.13**	0.019	-0.014	-0.028	0.041	0.17*
	Tertiary # Age	-0.15**	-0.042	0.14**	-0.099	0.13	0.26**
<b>Birth cohort</b>	1938-1943 (ref)						
	1944-1948	-2.33***	-0.33	-2.86***	-2.47*	0.87	-2.04*
	1949-1953				-5.01***	-1.49	-2.09*
<b>Intercept</b>		-2.27**	-0.68	7.05***	-26.3***	4.39***	0.95
<b>Residual ICC<sup>1</sup></b>		0.59	0.53	0.51	0.57	0.52	0.45
<b>Observations</b>		31352	31352	31352	9376	9376	9376
<b>Participants</b>		7838	7838	7838	2587	2587	2587

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Note: We multiplied coordinates by (-100) for better readability. Estimations restricted to ages 50 to 75 years old.

<sup>1</sup> Intra-class correlation of the residuals (for the four observations of each participant).

Example: on dimension 1 for men, when a participant became one year older, his coordinate (multiplied by 100) declined by 0.80. If he had secondary education, his coordinate is higher than if he had primary education by 1.71.

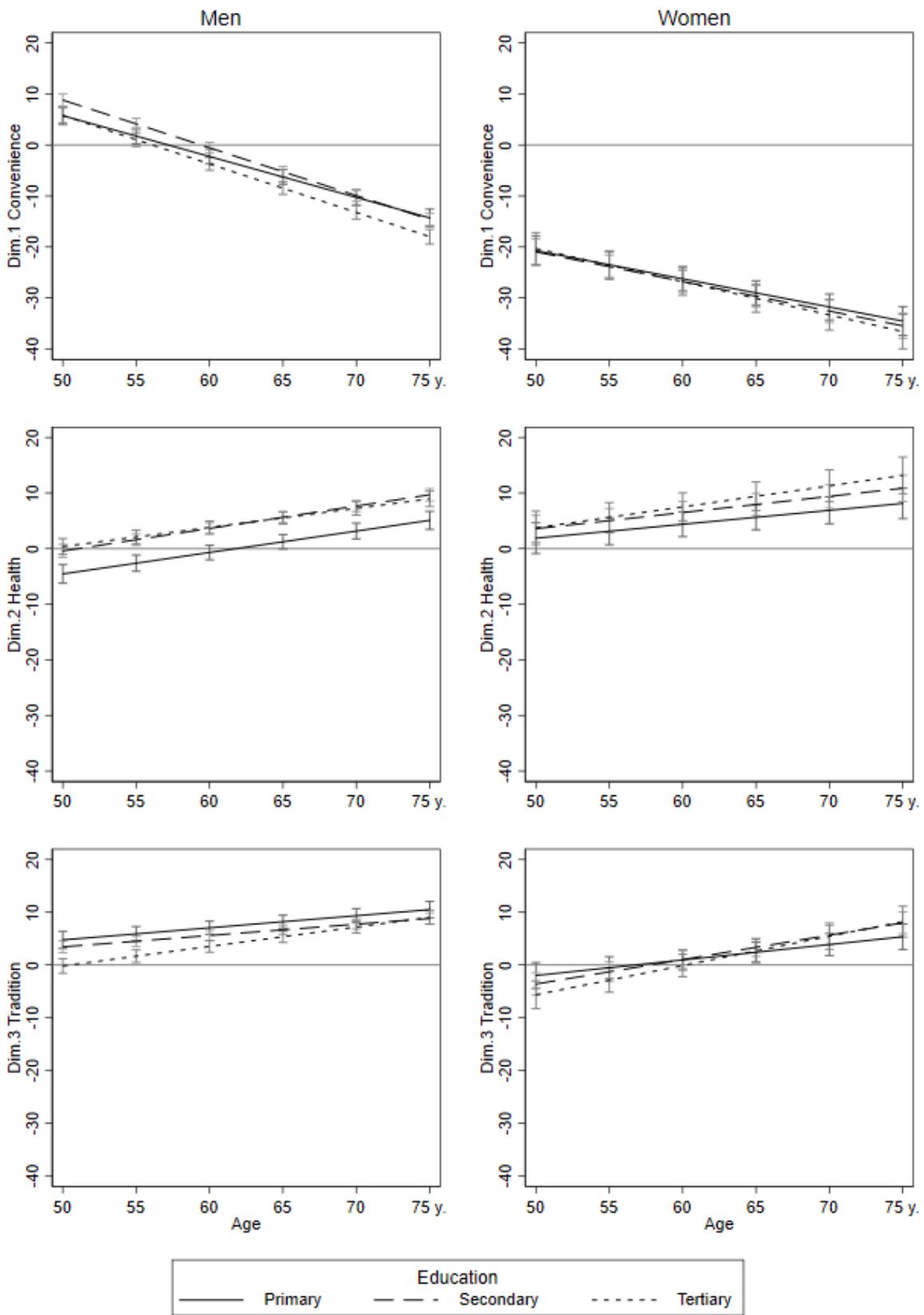
## Modes of engagement with eating across participants

The intercept of the models reflects the overall position of men and women on the three dimensions. Women score much lower on the first dimension (convenience). They also score higher on the second (health). Men have a higher score on the third dimension (tradition). Coefficients for educational levels indicate that, for both men and women, more educated participants engage more with eating in terms of health. More educated men also engage less with eating in terms of tradition. But education was not associated with eating as convenience.

These results are consistent with cross-sectional results on differences in food consumption: women and people with higher education show better knowledge and compliance with health recommendations and nutritional guidelines (Beagan et al., 2008; Fraser et al., 2000; Host et al., 2016; Irz et al., 2014; Reckinger & Régnier, 2017). The fact that, according to their identity as men or women, Gazel participants engage with eating differently is consistent with theories of practice: practices perform identities – for example, gender identities. Reciprocally, they are understood as

typically female or male (McPhail et al., 2012). Why eating should differ across educational level may be less straightforward in a practice perspective. Three interpretations come forward. First, Shove et al. (2012, p. 78) point out that ‘some practices can only be carried out by those who are fit and healthy ... or who already have certain skills or wealth’. If education is seen as proof of cultural resources, one could argue that eating healthily requires a higher educational level because this mode of engagement relies on scientific advice and formal rules such as ‘eat five fruit and vegetables a day’ (Reckinger & Régnier, 2017). Second, education and class position result in different opportunities to enter communities of practice and adopt modes of eating that may circulate more in specific social milieus (Plessz et al., 2016; Shove et al., 2012). Third, practices perform social identities and hierarchies such as social class or gender (Bourdieu, 1984; Cappellini et al., 2016; Schatzki, 1996, pp. 195–97). In this view, what matters is not the content of education but the oppositions between ‘higher’ and ‘lower’ education, matching oppositions in modes of engagement in practices (Southerton, 2006) or tastes (Bourdieu, 1984).

**Figure 2:** trends in eating over age and according to education and gender in Gazel cohort  
(predicted values from models in Table 2)



## **Ageing**

Ageing had the strongest effect on eating as convenience. As participants aged, their coordinates dropped significantly, indicating that they engaged less and less with eating as convenience. The effect of ageing is also significant on health and tradition, but in the opposite direction: as they grew older, participants' food consumption increasingly reflected engagements with eating as health and tradition.

As people become older, they increasingly face health problems and receive medical advice. Both encourage them to adopt healthier eating practices: this is consistent with their engagement with eating as health. Participants also increasingly engage in eating as tradition. Since they also move away from convenience, we can suggest the two following explanations: as people get older, they (or their partner) retire, they have more time to cook; their children also grow up and move away from home, and this may influence how they perform eating (Plessz et al., 2015; Plessz et al., 2016).

## **Differences in ageing**

Now we examine whether changes over age are similar across gender and educational level. The interpretation can be derived from the value and signs of the coefficients and from Figure 2.

### ***Gender***

On the second dimension, health, the ageing coefficient is similar across genders. This indicates that women's stronger engagement with proper eating as health is maintained over age: both men and women engage more and more with this dimension, but women consistently engage more. On the first dimension, there was a large difference, with men much closer to this mode of engagement as convenience. The positions of both gender groups declined with age, but this was stronger for men ( $-0.80$  per year vs.  $-0.55$  for women): male and female disengagements with eating as convenience are closing up, as if men have 'caught up' with women. On the third dimension, the effect is smaller and in the opposite direction: women have slightly "caught up" with men's higher engagement with proper eating as tradition.

### ***Education***

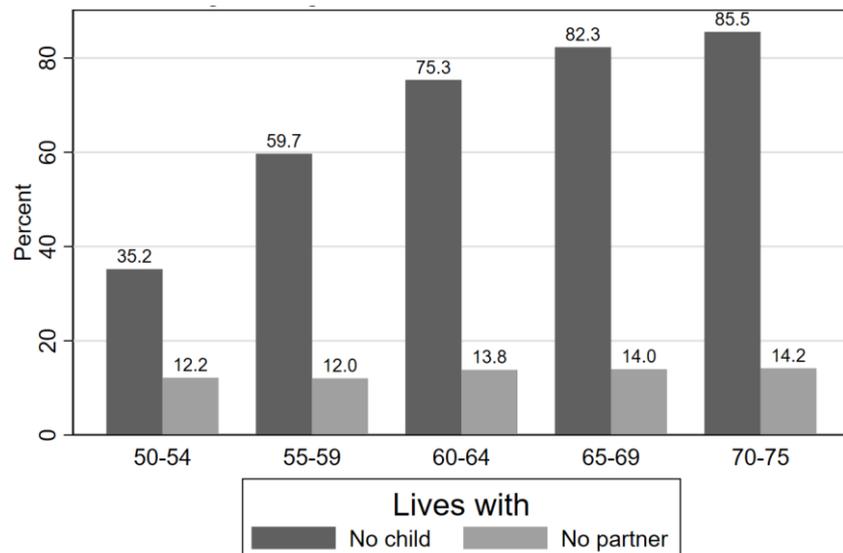
The interaction between ageing and education indicates whether the trend in ageing differs across educational level. If the interaction coefficients are not significant, it means that differences across educational levels are maintained. This is the case on the health dimension, as well as on convenience for women. On the convenience dimension for men, and on the tradition dimension

for both men and women, the interaction is significant and its coefficients have the same sign as the age coefficient. This means that the trends are steeper for the most educated participants: tertiary educated participants change faster. Tertiary educated men move away from eating as convenience faster, while more educated men and women catch up with less educated engagements with eating as tradition. At the age of 75, tertiary educated women even end up with higher scores on this dimension.

According to our results, the modes of engagements in eating, as evidenced by the patterns of food consumption, differ across gender (women are farther from the market definition of proper eating) and education (tertiary educated participants are closer to nutritional definition). As participants age, their food consumption is decreasingly in line with market definitions of the proper diet as convenience and more with health and tradition. Changes in participants' living arrangements may prefigure some modes of engagements with eating as easier or harder to achieve. Arrangements, in Schatzki's (2002) term, include all the aspects of 'context' that make sense for the performance of the practice. Most importantly, they include both material settings and social relations. This is a very broad question so we selected specific aspects of living arrangements. A well-established result of studies on food consumption is that food practices are about care and 'doing family' (DeVault, 1991; Moisio et al., 2004; Thorsted & Anving, 2010). We thus focused on living arrangements as living with or without a partner and children.

### **Living arrangements and food practices**

As Figure 2 shows, in our sample from ages 50 to 75, the percentage of participants who didn't live with children rose from 35.2 per cent to 85.5 per cent. The percentage who lived without a partner increased by 2 percentage points. We added these two variables to the previous models in Table 3.



**Figure 3:** Living arrangements over age in Gazel cohort

**Table 3:** Changes in eating over age and accounting for household structure

		Men			Women		
		Dim. 1	Dim. 2	Dim. 3	Dim. 1	Dim. 2	Dim. 3
		<i>Convenience</i>	<i>Health</i>	<i>Tradition</i>	<i>Convenience</i>	<i>Health</i>	<i>Tradition</i>
<b>Age</b>	(Per year)	-0.65***	0.38***	0.22***	-0.45***	0.26***	0.29***
<b>Education</b>	Primary (ref)						
	Secondary	1.75*	4.25***	-1.49*	-0.56	1.91	-0.081
	Tertiary	-1.43	4.48***	-3.55***	-0.50	3.43**	-0.82
<b>Interaction</b>	Secondary # Age	-0.13**	0.019	-0.015	-0.011	0.054	0.18*
	Tertiary # Age	-0.13*	-0.045	0.14**	-0.082	0.13	0.26**
<b>Lives with ...</b>	Partner (ref)						
	No partner	-1.58*	-8.38***	-3.21***	-3.94***	-8.39***	-6.60***
	Child(ren) (ref)						
	No child	-6.02***	0.78*	0.82*	-4.62***	1.72**	1.67**
<b>Birth cohort</b>	1938-1943 (ref)						
	1944-1948	-2.14***	-0.20	-2.82***	-2.29	1.11	-1.85
	1949-1953				-5.00***	-1.38	-2.00
<b>Intercept</b>		1.55*	-0.50	6.80***	-22.3***	5.44***	1.58
<b>Residual ICC<sup>1</sup></b>		0.60	0.52	0.51	0.57	0.51	0.44
<b>Observations</b>		31352	31352	31352	9376	9376	9376
<b>Participants</b>		7838	7838	7838	2587	2587	2587

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

<sup>1</sup> Intra-class correlation of the residuals (for the four observations of each participant).

Note: We multiplied coordinates by (-100) for better readability.

Example: men's engagement with eating as Convenience (dim. 1) declines by -6.02 when they don't live with a child.

Changes in living arrangements mattered on the three dimensions. Engaging in eating as *convenience* declined when children moved away from home. This might be due to the fact that convenience makes more sense when there are children at home and it is harder to coordinate meals and find time to cook. It might also be that food industries design convenience foods that specifically target children and younger consumers (or their parents). Engaging with eating as *health* and as *tradition* declined in the absence of a partner, but increased slightly when there was no child at home. As an illustration, participant #48100034 (Appendix A5) was single in 1998 and 2004 and had a partner in 2009 and 2014, when he scored much higher on the health dimension.

There are some differences between men and women. The coefficients on the tradition dimension are larger (in absolute value) for women, indicating that women's engagement with eating as tradition is more dependent on their living arrangements than men's. The absence of a partner had a stronger effect on women's engagement with tradition.

The question, then, is whether changes in living arrangements (or the corresponding events: loss of the partner, union formation or break-up, children leaving the parental home) account for the changes that we attribute to age. This can be inferred from comparing the coefficients for age in Table 2 and Table 3. When the age coefficient is smaller in absolute value, we can suspect that changes in living arrangements accounted for what we thought was the effect of age. This happens on the first dimension, convenience. But the age coefficient remains relatively large, and is statistically significant. The age coefficients on the dimensions of health and tradition are very similar, with those in Table 2 indicating that age and living arrangements are both associated with changes in eating.

What remains attributed to ageing might be accounted for by other biographical events, such as retirement (Plessz et al., 2015), changing location or illness. It might also have other explanations, such as internal dynamics of the practice (as when people become experts or get tired), or the fact that age is also part of social identities and people are supposed to perform practices appropriate to their age (Backett & Davison, 1995). Even earlier biographical events might have triggered changes: the trends captured here have likely started earlier in the life of the study participants.

## Conclusion

In this article, we presented a bird's eye view of the practice and a micro-level analysis of how individuals changed their food consumption over time. The first of these reveals a stable teleo-

affective structure, while the second shows that patterns in practice change due to both practitioners' characteristics and the context (here, living arrangements).

### **Teleo-affective structure**

Among the Gazel participants, food consumption was structured along three dimensions. We interpreted these dimensions as three modes of engagement in eating practices: convenience, health and tradition. We can relate these modes of engagement to different definitions of proper eating, disseminated and supported by specific stakeholders (Plessz et al., 2016; Warde, 2016). Eating as convenience (with more fat, sweet and processed foods) can be connected to market actors of the agri-food industry. Health (more fruits, vegetables and dairy) echoes public health authorities and nutrition recommendations. Eating as tradition (more meat, cheese and wine) points towards French cuisine and the catering industry. Tracing how Gazel participants moved in this three-dimensional space after 1998 allowed us to identify how their engagements with eating evolved as they aged. We found that participants changed their food consumption and engagements with eating, but the three underlying modes of engagement were the same during the 16 years of follow-up. Men engaged more with eating as convenience or tradition; women and the highly educated engaged more in eating as health.

This stability is probably enhanced by our study design: Gazel participants were French men and women born over 10 or 15 years (during and after World War II) and shared similar employment relationships (as employees of a state-owned company): they are less diverse than the whole French population. On the other side, the nutritional literature often found similar dietary patterns in various contexts (Kant, 2004). The strong inertia in the macro-level organisation of the practice remains an interesting feature. It gives empirical meaning to the analytical distinction between the practice as entity and the many and varied performances that happen every day (Shove et al., 2012, pp. 99–102; Warde, 2016, p. 42). The practice as entity has a teleo-affective *structure* in part because the performances are varied in a meaningful way: they can be related to contrasted modes of engagement (we found three) and to social identities (feminine, older, highly educated, etc.).

Theories of practice have long offered little methodological guidance to sociologists of consumption, especially when it comes to quantitative material (Halkier, 2017). Geometrical data analysis techniques such as multiple correspondence analysis have been a classic in the study of consumption and taste since Bourdieu's *Distinction* (1979), even though their interpretation is sometimes tricky, as recent debates illustrate (Atkinson & Deeming, 2015; Flemmen & Hjellbrekke,

2016; Mills, 2014; Savage et al., 2013). Here, we make a methodological contribution by showing how research questions rooted in the theories of practice can benefit from them: we used them to extract the internal organisation of the practice-as-entity from data on individual performances.

### **Patterns and dynamics**

Empirically, the associations between individual or household characteristics and consumption or practice are well established. From a praxeological perspective, this could be phrased as follows: some practices recruit practitioners with specific age, gender, education and so on (Pred, 1981; Shove et al., 2012). For example, cooking has long been associated to being an adult woman. Other practices, such as eating, are performed by everyone, but in different ways. Conversely, practices contribute to performing gender, age or class. For example, in lay perceptions of lifestyles, eating healthily is a mode of engagement suitable for women and 'older' persons (Backett & Davison, 1995). While gender or class identity may not change, age does. As a consequence, people are constantly adopting practices that are suitable for their age, abandoning practices they are 'too old for' and changing how they engage in lifelong practices. In our data, respondents' food consumption was increasingly in line with public health recommendations, indicating that Gazel participants adopted this mode of engagement with eating. It should be noted that age, gender and class identities intersect with one another (and with other dimensions of social identities and inequalities) (King & Calasanti, 2013). In our results, this is illustrated by the closing gap between men and women on the first dimension (convenience): gender differences are not stable over the life-course – and, conversely, life-courses have gender-specific dynamics (Riley, 1988).

Practices as performances change not only because people adopt the practices (or modes of engagement in practices) suitable to their age. Three additional drivers can be identified. First, a range of processes belong to the internal dynamics of practices. With time, practitioners may become more expert in the practice. They may move from casual to amateur to enthusiast practitioners. They may enter communities of practice that introduce them to different procedures (Shove et al., 2012) or they may abandon the practice. In our case, as participants aged, they might have learnt more about dietary recommendations and their motivations. Incorporation is relevant here, as people may find that some foods fit better with their ageing bodies. Second, a practice may become harder or easier to perform as other, related practices change: people cook less when they eat out more often (Plessz & Étilé, 2019); changes in eating in the Turks and Caicos Islands are related to changes in Northern-American tourism practices (Paddock, 2017b). Third, changes in living arrangements, understood as the material settings and social relations in which people

perform practices, may trigger major changes in 'modes of eating' (what people eat and how they engage with it), such as when a change in employment reduces the need for quick meals and initiates new routines (House, 2019).

As a consequence, biographical transitions appear as key moments of practice change (House, 2019; Paddock, 2017a; Plessz et al., 2016; Rau & Manton, 2016). Events such as childbirth, union formation or break-up, changing job or retirement have consequences on performances and modes of engagement. They change social identities, living arrangements and many different and interrelated practices in which people engage (parenting practices, working practices, etc.). In our research, we only scratched the surface of how life-courses and the dynamics of practices intersect: we have found that engagements with foods changed along with living arrangements. Just as people age differently according to gender and class, a biographical event may have different consequences for men and women, middle-class people and working-class people (Holdsworth et al., 2017 on drinking; Plessz & Guéguen, 2017 on vegetable consumption). In this perspective, there is still a lot to investigate as regards the complex interplay between ageing, period and cohort effects. We did not account for period effects, such as changes in the food supply, the introduction of nutrition education messages in food advertisement, or the rising concern for the environmental consequences of food consumption.<sup>5</sup> We pooled together 15 birth-years (which is not much compared to studies on adult population), and controlled for birth cohort, but a thorough investigation of differences in ageing across generation would require other data.

Theories of practice have led sociologists of consumption to investigate in much more detail consumption as a social activity, what people do when they consume and what their consumption owes to broader contexts such as practices, infrastructures or relationships (Evans, 2018; Halkier et al., 2011; Warde, 2014, 2017). This may have been at the cost of leaving aside, at least temporarily, the social stratification of consumption, a topic that has remained central in the study of cultural consumption (Chan, 2010; Flemmen et al., 2019; Warde, 2015), but also in other critical perspectives on everyday life such as institutional ethnography (Luken & Vaughan, 2006; McCoy, 2009; Smith, 2005). Theories of practice are diverse, versatile and easily mixed with other sociological

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<sup>5</sup> Our models control for birth cohort and leave aside period effects. This means that we estimate models as if period effects did not interact with cohort and age. In other words, we do as if the effect of period was the same for all ages and cohorts. We make this assumption because the literature does not provide sufficient basis for any other assumption in France. For example, the French regulation which introduced nutrition education messages in advertisement in 2006 would be an interesting case-study. In 2010, knowledge of the messages had improved but "seemed to influence behaviour only marginally", and difference across age category was not investigated (Jourdain Menninger et al., 2010, p. 21).

frameworks (Warde, 2014). Differences and inequalities across gender, class, age, ethnicity or location are at the core of sociology as an academic discipline and fundamental for the environmental and social sustainability of our societies. Combining theories of practice with other sociological accounts of consumption has the potential to shed new light on the social stratification of consumption and its dynamics.

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## Appendices

### A1. Descriptive statistics for the Gazel cohort and the participants selected for this study

Cohort (N = 20,625)		Study population (N = 10,425)	
Men	Women	Men	Women
(N = 15,011)	(N = 5,614)	(N = 7,838)	(N = 2,587)

<b>Education</b>				
Primary	21.5	29.7	19.1	27.6
Secondary	52.1	47.5	51.9	45.9
Tertiary	26.4	22.8	29.1	26.4
<b>Birth cohort</b>				
1939-1943	42.3	24.6	42.8	25.1
1944-1948	57.7	36.3	57.2	37.3
1949-1953 (women)	0	39.2	0	37.6
<b>With partner in 1989</b>				
	93.1	77.7	94.3	80.3

Column percentages. 1989 is the year of inclusion in the cohort.

## A2. Statistical analyses: details

In order to *identify modes of engagement in eating*, we performed a multiple correspondence analysis (MCA) on the 1998 data, using the 22 variables describing food consumption and listed in appendix 0. MCA is suitable for variables coded into categories. The inertia of the dimensions is lower than that produced by a principal component analysis (Roux & Rouanet, 2010). In Stata 15 we used the command `mca [variables], method(indicator) normal(princ)`. After examining the screeplot (Appendix A4) we retained three dimensions. We computed the contributions according to the usual metrics, as found in reference textbooks (Roux & Rouanet, 2010) and other software such as R (package FactoMineR), SAS or SPAD. The contributions and coordinates for each modality appear in Appendix A4. We multiplied the coordinates on each dimension by  $(-100)$ , so that the results were easier to interpret (a positive score indicated a stronger engagement) and the models were easier to read (fewer decimals in Table 2 and Table 3). The interpretation of the three dimensions appear in Table 1. We checked the scatterplot of individuals (not shown) and found no outlier which might have distorted the dimensions.

In order to *identify individuals' modes of eating over time* we used the coordinates of each individual in the three-dimensional space constituted from the MCA dimensions in 1998. We computed these coordinates for 1998, but also for 2004, 2009 and 2014, by projecting the corresponding data-points as supplementary points (as if they were supplementary individuals). This procedure is explained by Coulangeon (2013) and Müller-Schneider (1994).

We thus obtained three continuous variables observed four times for each participant. In Appendix A5 a graph gives an example of how a randomly chosen participant can be traced in this three-dimensional space.

In order to *check whether the three modes of eating were stable over time*, we did the following for each of the 2004, 2009 and 2014 data. We built an MCA for this data. We examined the scree-plots and contributions to the dimensions in order to check that the first three dimensions could be interpreted as in 1998. We computed the coordinates of each participant on the three dimensions. These are the coordinates we would have used if we had decided to identify modes of eating in this dataset, ignoring the previous and following food questionnaires. We computed the correlation between these coordinates and those derived from the 1998 MCA. The higher the correlation, the more valid it is to use the coordinates derived from the dimensions built in 1998. The correlations appear in Appendix A6.

In order to *model changes in modes of eating*, we ran three regressions in which the dependent variables were the coordinates on the three dimensions of the MCA (we multiplied them by 100 in order to make the results easier to read). We have to take into account the fact that we have four observations for each individual. We ran models with a random intercept, which are suitable for repeated data and can accommodate both time-varying variables (such as age or marital status) and time-independent variables (education, birth cohort). Age was treated as a continuous variable and the estimation was restricted to ages 50 to 75 years.

The linear trend over age is an approximation which makes results easier to read and saves degrees of freedom when estimating the models. More detailed analysis (Appendix A7) shows that the trend is not linear, especially for dimension 1 (the slope is closer to zero after age 60). We have checked that this pattern is similar across educational level so this should not alter the estimation of the coefficients nor the interactions.

In order to examine *differences in ageing* across gender and educational level, we ran separate models for men and women. This was necessary because in the Gazel cohort, women born in 1949–53 have no male counterparts. Also, it allowed to check whether each characteristic of the participant and their living arrangement had a similar effect across gender. We were particularly interested in whether more educated participants age differently, so we added an interaction between age and education.

The statistical analyses described were carried out using Stata SE 15. The code generating the statistical analyses is available at ANONYMISED. The dataset is not publicly available because it contains sensitive personal information. It can be requested from the data provider (<https://www.gazel.inserm.fr/fr/la-cohorte-gazel>).

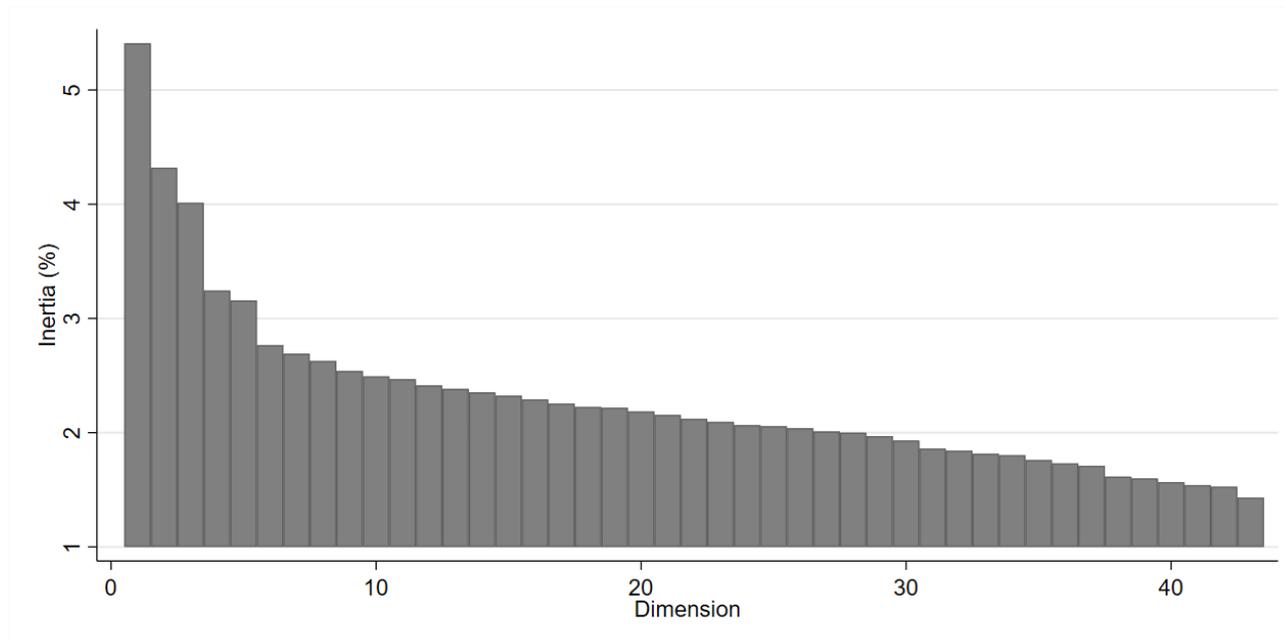
### A3. List of items included as active variables in the multiple correspondence analysis

The complete English version of the codebook for the Gazel cohort can be downloaded at:  
<https://www.gazel.inserm.fr/en/documentation/data-book>.

<b>Food frequency items</b>	<p><b>Meat</b> (beef, pork, veal, offal, etc.)</p> <p><b>Poultry</b> (chicken, turkey, etc.)</p> <p><b>Cold cuts</b> and delicatessen (ham, pâté, bacon, black pudding, chitterling sausage, etc.)</p> <p><b>Fish</b></p> <p><b>Eggs</b></p> <p><b>Fried foods</b> (French fries, crisps, fritters, battered meat or fish, etc)</p> <p><b>Carbs</b> except bread (pasta, rice, potatoes, pulses, peas, etc.)</p> <p><b>Cooked vegetables</b> as a starter, soup or main course (leeks, cabbage, green beans, etc.)</p> <p><b>Raw vegetables</b> (lettuce, carrots, tomatoes, radishes, beetroot, etc.)</p> <p><b>Milk</b></p> <p><b>Dairy products</b> (Swiss cheese, yoghurt, cottage cheese, etc.)</p> <p><b>Cheese</b></p> <p><b>Sweet desserts</b> (creamy desserts, puddings, ice creams, compotes), pastries, crackers, Danish pastries ...</p> <p><b>Fresh fruit</b> (including squeezed fruit)</p> <p><b>Bread</b> (baguette, bread, special breads, rusks, load, etc.)</p>
<b>Questions</b>	<p>How many Danish pastries (croissants, brioches, pains au chocolat, etc.) do you eat per week? (at breakfast, snack time ...)?</p> <p>How many lumps of sugar (except for sugar cubes) or teaspoons of powdered sugar do you consume per day (plain, in coffee, tea, yoghurt, etc.)?</p> <p>What volume of sweet drinks (sweetened fruit juices, syrups, sodas, Coca-Cola, Schweppes ...) do you drink per day?</p> <p>What type of fats do you use most often when cooking (one answer only) (butter, oil, margarine, other)?</p> <p>Do you eat 'light' or 'diet' products?</p> <p>How many cups of coffee do you drink per day?</p>

#### A4. Multiple correspondence analysis in 1998: detailed results

**Screepplot: inertia of the dimensions (% of total inertia)**



**Contribution and coordinates of the variable modalities**

Variable	Modality	Freq.	Dim. 1		Dim. 2		Dim. 3	
			Coord.	Contrib.	Coord.	Contrib.	Coord.	Contrib.
<b>Meat (red)</b>	<3/week	29%	0.64	<b>4.95</b>	0.28	1.21	0.24	0.92
	3-6/week	49%	-0.19	0.73	-0.18	0.78	0.16	0.69
	Everyday	22%	-0.42	1.63	0.02	0.00	-0.65	<b>5.33</b>
<b>Poultry</b>	<3/week	7%	0.27	0.21	0.64	1.43	-0.61	1.41
	3-6/week	70%	-0.04	0.04	0.08	0.24	-0.02	0.02
	Everyday	23%	0.03	0.01	-0.43	2.22	0.23	0.71
<b>Cold cuts</b>	<3/week	28%	0.86	<b>8.75</b>	0.12	0.22	0.08	0.09
	3-6/week	52%	-0.21	0.96	-0.02	0.01	0.12	0.45
	Everyday	20%	-0.67	<b>3.71</b>	-0.13	0.18	-0.44	2.14
<b>Fish</b>	<3/week	9%	-0.20	0.15	0.72	2.47	-0.66	2.20
	3-6/week	70%	-0.13	0.53	0.04	0.06	-0.02	0.01
	Everyday	21%	0.53	2.51	-0.45	2.21	0.34	1.38
<b>Eggs</b>	Never	20%	0.49	2.05	0.40	1.70	-0.07	0.06
	1-2/week	71%	-0.12	0.45	-0.05	0.08	0.01	0.00
	>3/week	8%	-0.15	0.07	-0.58	1.46	0.09	0.04
<b>Fried foods</b>	Never	52%	0.57	<b>6.98</b>	0.05	0.07	-0.02	0.01
	min 1/week	48%	-0.61	<b>7.57</b>	-0.06	0.08	0.02	0.02
<b>Carbs</b>	<3/week	33%	0.49	<b>3.31</b>	0.46	<b>3.71</b>	0.16	0.50
	3-6/week	49%	-0.25	1.32	-0.15	0.59	0.10	0.29
	Everyday	17%	-0.22	0.34	-0.46	1.91	-0.61	<b>3.61</b>
<b>Cooked vegetables</b>	<3/week	36%	-0.26	1.03	0.75	<b>10.52</b>	0.00	0.00
	3-6/week	40%	-0.12	0.23	-0.25	1.32	0.25	1.37

Variable	Modality	Freq.	Dim. 1		Dim. 2		Dim. 3	
			Coord.	Contrib.	Coord.	Contrib.	Coord.	Contrib.
Raw vegetables	Everyday	24%	0.59	<b>3.46</b>	-0.70	<b>6.16</b>	-0.41	2.25
	<3/week	28%	-0.26	0.81	0.88	<b>11.24</b>	-0.01	0.00
Milk	3-6/week	41%	-0.17	0.52	-0.15	0.50	0.31	2.15
	Everyday	32%	0.45	2.75	-0.57	<b>5.46</b>	-0.38	2.62
	Never	44%	0.08	0.12	0.34	2.70	-0.26	1.67
Fruit	1-2/week	12%	-0.20	0.20	0.00	0.00	0.81	<b>4.35</b>
	>3/week	45%	-0.03	0.01	-0.34	2.64	0.04	0.04
	<3/week	24%	-0.30	0.90	0.78	<b>7.74</b>	-0.06	0.05
Bread	3-6/week	26%	-0.32	1.10	0.02	0.01	0.48	3.31
	Everyday	50%	0.31	1.98	-0.39	<b>3.98</b>	-0.21	1.30
Pastries	<6/week	10%	0.58	1.40	0.89	<b>4.23</b>	0.93	<b>4.95</b>
	Everyday	90%	-0.07	0.16	-0.10	0.48	-0.11	0.56
Sugar lumps	Never	57%	0.30	2.10	0.06	0.12	-0.25	2.06
	min 1/week	43%	-0.40	2.84	-0.09	0.17	0.34	2.78
	0	38%	0.56	<b>5.09</b>	0.09	0.16	0.16	0.55
Sweet drinks	1-2	39%	-0.19	0.60	-0.09	0.15	0.06	0.07
	3-4	18%	-0.59	2.55	-0.05	0.03	-0.33	1.12
	>4 /day	5%	-0.77	1.22	0.18	0.09	-0.49	0.66
	Never	68%	0.24	1.67	0.02	0.01	-0.11	0.49
	min 1/week	32%	-0.52	<b>3.63</b>	-0.04	0.02	0.24	1.07
Fat (cooking)	Butter	22%	-0.46	1.89	0.21	0.50	-0.23	0.67
	Oil	50%	0.19	0.74	-0.07	0.15	0.06	0.09
	Margarine	28%	0.02	0.00	-0.03	0.01	0.08	0.11
Coffee cups	0	11%	0.32	0.45	-0.07	0.03	0.11	0.08
	1-2	46%	-0.02	0.01	-0.13	0.39	-0.04	0.03
	>2/day	43%	-0.06	0.06	0.15	0.52	0.01	0.00
Diet foods	0	26%	-0.27	0.78	0.29	1.11	-0.55	<b>4.37</b>
	1-2	45%	-0.02	0.00	-0.10	0.22	0.01	0.00
	>2/day	29%	0.26	0.84	-0.10	0.16	0.47	3.56
Wine glasses	0-1	19%	0.45	1.57	0.06	0.03	0.15	0.25
	2	52%	0.00	0.00	0.01	0.00	0.27	2.18
	3 or more/day	29%	-0.29	1.04	-0.05	0.04	-0.59	<b>5.65</b>
Cheese	Never	6%	0.61	0.92	0.58	1.04	-0.19	0.12
	1-2/week	14%	0.46	1.23	0.55	2.16	0.48	1.81
	>3/week	26%	-0.17	0.32	0.19	0.46	0.53	<b>4.10</b>
Desserts	Everyday	55%	-0.10	0.23	-0.29	2.35	-0.35	<b>3.79</b>
	Never	26%	0.60	<b>3.89</b>	0.40	2.17	-0.48	3.35
	1-2/week	21%	0.15	0.20	0.05	0.03	-0.07	0.06
	>3/week	37%	-0.32	1.55	-0.16	0.49	0.35	2.58
	Everyday	16%	-0.41	1.18	-0.33	0.96	0.05	0.02

Variable	Modality	Freq.	Dim. 1		Dim. 2		Dim. 3	
			Coord.	Contrib.	Coord.	Contrib.	Coord.	Contrib.
Dairy	Never	15%	-0.12	0.08	0.62	<b>2.91</b>	-1.06	<b>9.24</b>
	1-2/week	15%	-0.33	0.68	0.52	2.12	0.13	0.14
	>3/week	20%	-0.26	0.58	0.11	0.13	0.63	<b>4.50</b>
	Everyday	50%	0.24	1.17	-0.37	<b>3.72</b>	0.02	0.01

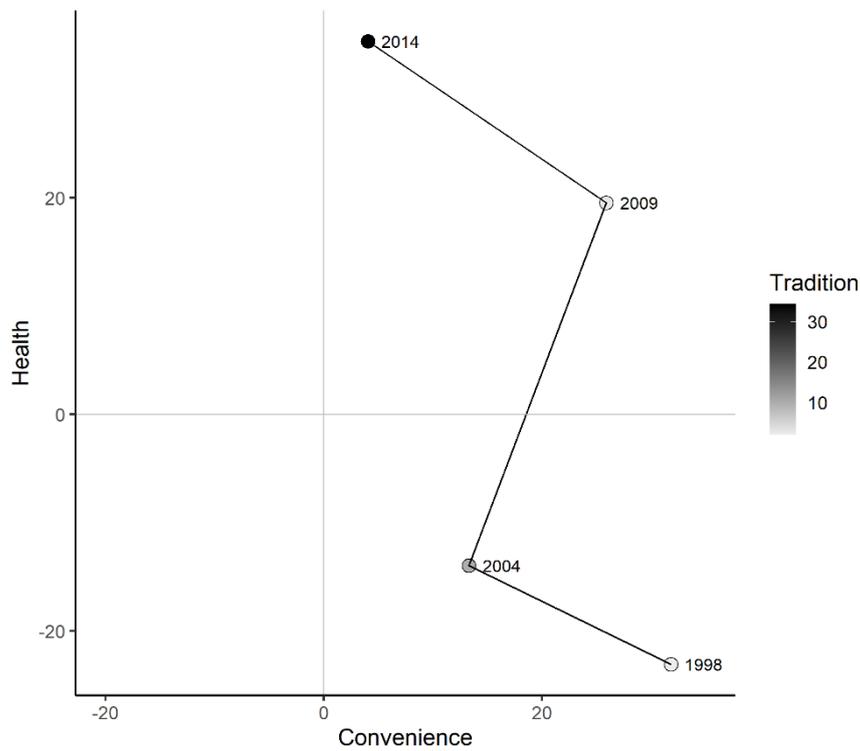
Freq: Frequency in the study sample.

Coord: coordinate on the dimension. In the other tables and figures, we multiplied them by (-100).

Contr: Contribution to the dimension inertia. Average contribution: 1.52. The 10 highest contributions on each dimension are **boldface and shaded**.

### A5. Tracing a participant in the three-dimensional space provided from the MCA

*Coordinates of participant #48100034 in 1998, 2004, 2009 and 2014*



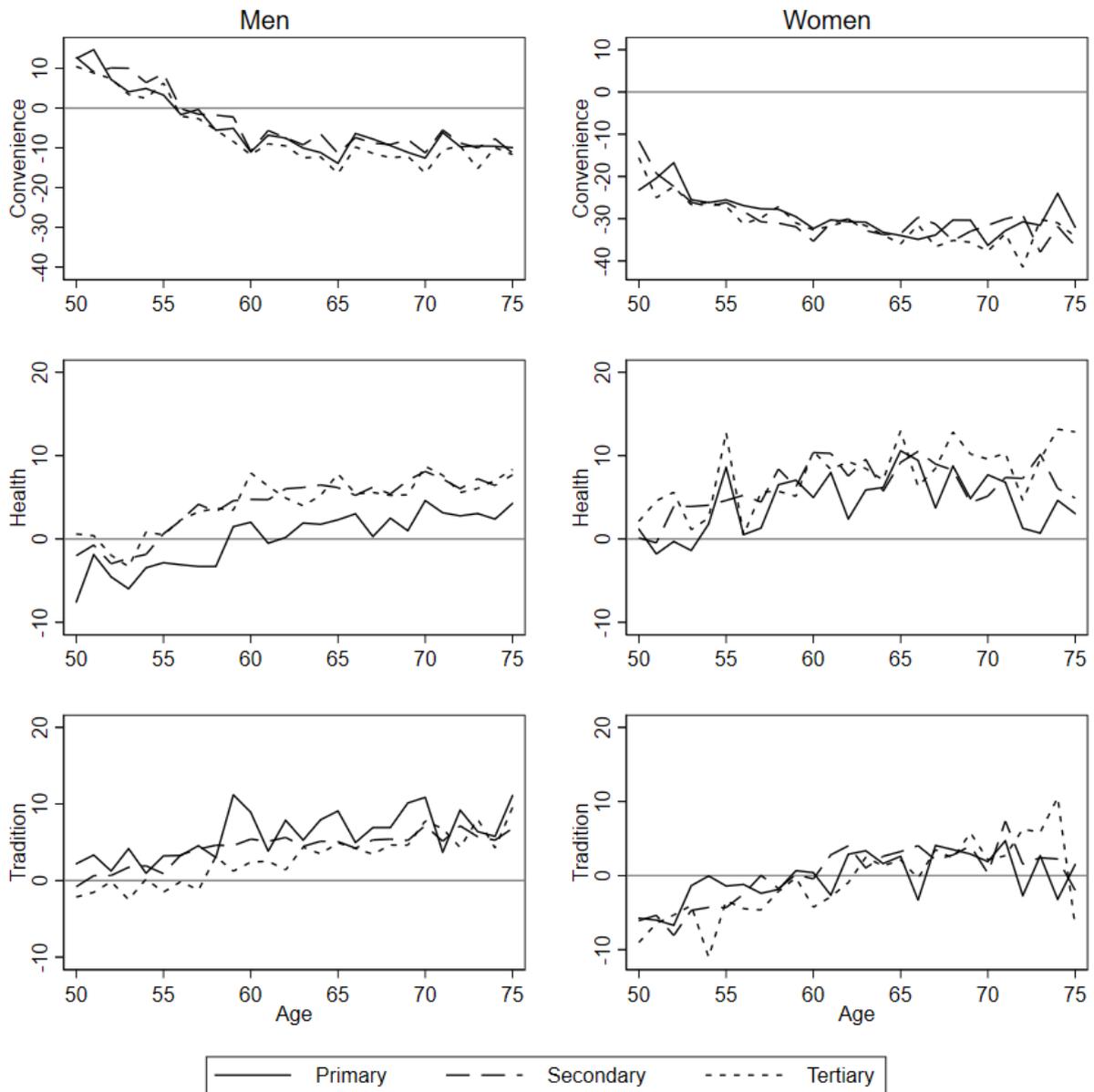
Coordinates were multiplied by (-100).

Participant #48100034 is a man with secondary education. In 1998 he was 54, and lived with a child and no partner. In 2004, he was retired and his child had left home. In 2009 and 2014, he had a partner.

**A6. Correlation of the coordinates in the 1998 MCA and in independent MCAs on each food-questionnaire year**

<b>Dimension</b>	<b>Year</b>	<b>Correlation coefficient</b>
<b>1</b>	1998	1
	2004	0.989
	2009	0.959
	2014	0.947
<b>2</b>	1998	1
	2004	0.979
	2009	0.932
	2014	0.949
<b>3</b>	1998	1
	2004	0.973
	2009	0.870
	2014	0.850

**A7. Predicted values with no assumption of a linear trend in age**



Predicted values from the same model as in Table 2, but with age as a categorical variable (modalities being: age 50, age51, age52, etc.).