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ORIGINAL ARTICLE

The impact of patients' involvement in cooking on their mortality and morbidity: A 19-year follow-up of patients diagnosed with type 2 diabetes mellitus

SOFIE JANDORF, VOLKERT SIERSMA, RASMUS KØSTER-RASMUSSEN, NIELS DE FINE OLIVARIUS & FRANS BOCH WALDORFF

Research Unit for General Practice and Section of General Practice, Department of Public Health, University of Copenhagen, Copenhagen, Denmark

Abstract

Objective. This study explored the impact of involvement in cooking on long-term morbidity and mortality among patients newly diagnosed with type 2 diabetes mellitus (T2DM). *Design and subjects*. Data are from the population-based study Diabetes Care in General Practice. In baseline questionnaires, 1348 patients newly diagnosed with T2DM gave information on how frequently they consumed a warm main meal and how often they cooked it themselves. The selected patients were followed up for 19 years in the Danish National Patient Registry and the Danish Register of Causes of Death. *Main outcome measures*. This study analysed the association between involvement in cooking and each of seven pre-specified outcomes was analysed in Cox regression models with stepwise adjustment for possible confounders and mediators. *Results*. 92% of the patients with T2DM consumed a warm main meal ≥ five times per week. Among these, women who cooked for themselves less than once a week had a higher risk of diabetes-related deaths (HR 1.86 [95% CI 1.03–3.35], p = 0.039) and stroke (HR 2.47 [95% CI 1.08–5.65], p = 0.033), after adjustment for confounders. For men, infrequent cooking was not related to increased risk for the outcomes investigated. *Conclusions*. In patients newly diagnosed with T2DM and with a regular intake of warm main meals, infrequent involvement in cooking was associated with an increased risk of diabetes-related death and stroke for women, but not for men. General practitioners should pay special attention to managing diabetes treatment in female patients newly diagnosed with T2DM who report infrequent involvement in cooking.

Key Words: *Cooking, Denmark, diabetes-related deaths, general practice, instrumental activities of daily living, meals, self-care, stroke, type 2 diabetes mellitus*

Introduction

Diagnosis and management of patients with type 2 diabetes mellitus (T2DM) is primarily carried out in general practice [1,2], where lifestyle advice is a core element in the treatment of all patients [3]. Current lifestyle recommendations for T2DM patients emphasize dietary change [4], together with regular exercise, weight loss, smoking cessation, and reduced alcohol intake [3,5]. Barriers to meeting nutritional recommendations for patients with diabetes include a lack of understanding of dietary guidelines, lack of family support, lack of time, food preferences, cooking habits [6,7], and functional difficulties [8], together with poor dietary counselling by health professionals [9].

In Denmark cooking habits are characterized by a common intake of homemade warm main meals [7,10]. In 2012, 86% of the Danish population consumed a homemade evening meal at least five times a week [11]. The responsibility for cooking still lies primarily with females, typically a spouse (66%) [7], although a steady increase in male responsibility has been evident over the last few decades [12].

Correspondence: Sofie Jandorf, Research Unit for General Practice, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5, PO Box 2099, DK-1014 Copenhagen K, Denmark. Tel: +45 26 25 67 39. Fax: +45 35 32 71 31. E-mail: sofie@jandorf.dk

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Lifestyle changes are beneficial for type 2 diabetes mellitus (T2DM) patients, but the impact of cooking on outcomes is underexplored:

- Among women with T2DM, infrequent involvement in cooking was associated with increased risk of diabetes-related death and stroke.
- This association was not found in men.
- In primary care special attention should be paid to women diagnosed with T2DM who report infrequent involvement in cooking.

Self-care includes both therapeutic care (administration of medicine, compliance etc.) and personal care (activities of daily living [ADL] and instrumental activities of daily living [IADL]) [13]. IADL involves patients planning, preparing, and serving adequate meals independently [14]. The prevalence of ADL and IADL limitations increases with age [8], and the onset of limitations may be an indicator of adverse future health changes [15,16]. Searching the literature did not reveal any studies investigating the long-term effect of cooking one's own food in patients with or without T2DM.

The hypothesis of this study is that IADL, including involvement in cooking, at diagnosis of T2DM, may be a necessary condition for adapting to a healthy diet and also a proxy for future good self-care, i.e. the efforts required to optimize metabolic control in order to postpone the development of diabetic complications. Thus, this study explores the impact of preparing warm main meals on long-term morbidity and mortality among patients newly diagnosed with T2DM.

Material and methods

Study population and design

This is a population-based inception cohort study. Data are from the Diabetes Care in General Practice study, which was a pragmatic, open, cluster-randomized, controlled trial with randomization of 474 general practitioners (GPs) to either structured personal care or routine care. A detailed description of the study design has been reported previously [17]. A total of 1381 patients aged ≥ 40 years newly diagnosed with diabetes (confirmed by fasting blood/plasma glucose ≥ 7.0/8.0 mmol/l) from 1 March 1989 to 28 February 1992 were included. The primary protocol-based exclusion criteria were life-threatening somatic disease, severe mental illness, or unwillingness to participate (Figure 1). The patients included in the trial were then followed up for 19 years in the Danish National Patient Registry, which holds information on almost all contacts with hospitals in Denmark [18], and the Danish Register of Causes of Death, which contains information regarding underlying and possible contributory causes of death [19]. These two registries, together with the Danish Civil Registration System [20], provided information on mortality and relevant morbidity. Patients were followed until death or censoring on 1 January 2009.

Measurements and definitions

At the time of diabetes diagnosis, the GPs measured blood pressure, body weight, and height. Hypertension was defined as systolic/diastolic blood pressure ≥ 160/90 mmHg and/or the use of antihypertensive and/or diuretic drugs. Clinical chemistry was centralized: diagnostic plasma glucose level, total cholesterols, and fasting triglycerides. Microalbuminuria was defined as urinary albumin concentration ≥ 15–< 200 mg/l and proteinuria as ≥ 200 mg/l. In baseline questionnaires patients gave information concerning whether they lived alone, residence (rural or non-rural municipality defined by postal codes [21]), education (basic school education only or further education), smoking habits (current or former/never), and three items to describe functional level: leisure-time physical activity (sedentary or active), the ability to walk up

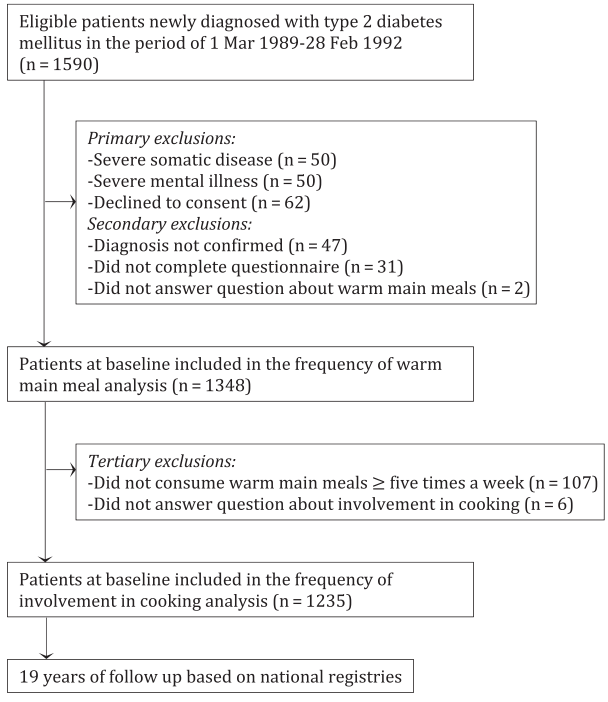

Figure 1. Patient flow through trial.

or down the stairs without resting (with no difficulty or with some/much difficulty), and home care assistance (yes/no). Questions concerning meals and cooking habits were modified from a nationwide dietary survey [10]: "How often do you consume a warm main meal per week?" (zero to seven times per week, regardless of whether the warm main meal was consumed for lunch or supper), and "How often do you cook warm meals" (never, < once per week (cooking once per week was not recorded), twice per week, almost every day, and every day). A priori a frequent intake was pragmatically defined as ≥five meals per week and infrequent cooking was defined as <once per week. Comorbidity was assessed with Charlson's comorbidity index over the 10 years preceding diabetes diagnosis [22]. The seven outcomes have been defined previously [17]: all-cause mortality, diabetes-related deaths, any diabetes-related endpoint, myocardial infarction, stroke, peripheral disease, and microvascular disease see Supplementary material, Appendix I available online at http://informahealthcare.com/doi/abs/10.3109/02813432.2015.1001940.

Statistical analysis

First, the study explored the patient characteristics and the number of warm meals consumed per week see Supplementary material, Appendix II–III available online at http://informahealthcare.com/doi/abs/10.3109/02813432.2015.1001940. To ensure a frequent intake of main meals in the following analyses, the group of patients with infrequent intake was excluded. Then, among those who consumed meals regularly, it was examined whether involvement in cooking was associated with mortality and morbidity (see Figure 1). The association between involvement in cooking and the incidence of each of the seven outcomes was analysed in Cox regression models. Censoring events were end of the follow-up period or death in participants with non-fatal outcomes. Analyses were adjusted in two multivariate models. Model 1 was adjusted for randomization group and possible confounders (sociodemographic, clinical, behavioural, and functional level variables) to assess the hypothesis of a risk reduction associated with cooking one's own food. Model 2 was additionally adjusted for possible biochemical mediators to assess whether the anticipated positive effects from Model 1 were explained by diabetes-specific risk factors. Patients with missing values on one or more variables were omitted from the analyses where these variables were included. Absolute risks for each outcome were calculated as the number of patients experiencing the corresponding outcome divided by the sum of the risk times (i.e. from diagnosis to the first occurrence of the outcome, death, or end of follow-up). Patients with any occurrence of an outcome before diabetes diagnosis were excluded from the analyses pertaining to that outcome. Analyses were done separately for men and women; however, gender difference was tested by the interaction of gender and involvement in cooking in a joint model for men and women. A p-value < 0.05 was taken as statistically significant. Statistical analyses were performed with SAS version 9.3 (SAS Institute, Cary, NC, USA).

Results

Patient characteristics

Of the 1348 patients included in the study, 1235 (92%) regularly consumed a warm main meal. The following analyses included only these 1235 patients (see Figure 1), and among these approximately a quarter of the patients infrequently prepared warm meals (Table I). More women than men were frequently involved in cooking.

The 37 women who cooked infrequently differed from the women who cooked frequently: they were older, more often lived alone, had more renal involvement but lower BMI, lower physical activity and low mobility, more often used home care, and had more comorbidity (Table I). In contrast, men who cooked infrequently did not differ particularly from men who cooked more frequently, and the comparison groups were of similar size.

For both sexes, those who rarely cooked generally had a higher absolute risk for an adverse event than those more frequently involved in cooking, except for the rarest events (Table II).

Multivariate analysis

In the models adjusted for confounders these differences were statistically significant for women regarding diabetes-related deaths (HR 1.86 [95% CI 1.03–3.35], $p = 0.039$) and stroke (HR 2.47 [95% CI 1.08–5.65], $p = 0.033$) (see Table II). The association with stroke persisted when the analysis was further adjusted for biochemical mediators (HR 2.38 [95% CI 1.00–5.67], $p = 0.050$). For men, infrequent involvement in cooking was not associated with increased risk; on the contrary there was a trend towards a reduced risk of diabetes-related death, myocardial infarction, peripheral vascular disease, and microvascular disease (see subgroup analyses in Supplementary material, Appendix IV available online at http://informahealthcare.com/doi/abs/10.3109/02813432.2015.1001940).

Table I. Patient characteristics at diabetes diagnosis according to involvement in cooking.

	Involvement in cooking at diabetes diagnosis (n = 1235)[1]			
	Infrequent (< once per week) (n = 318)		Frequent (2–7 times per week) (n = 917)	
	Females (n = 37)	Males (n = 281)	Females (n = 539)	Males (n = 378)
Sociodemographic				
Age, years	79.7 (75.2–85.4)	67.9 (58.3–74.7)	66.9 (57.8–74.7)	61.9 (51.7–69.1)
Living alone[2]	25 (67.6)	45 (16.0)	201 (37.4)	99 (26.2)
Rural residence[2]	10 (27.8)	39 (14.7)	120 (23.2)	97 (26.6)
Basic school education only[2]	34 (94.4)	208 (75.6)	453 (86.6)	251 (69.2)
Biochemical				
Diagnostic plasma glucose (mmol/L)	13.0 (10.3–16.1)	13.7 (11.1–17.8)	13.7 (10.7–17.0)	13.7 (10.7–16.8)
Fasting triglyceride (mmol/L)	2.03 (1.59–2.88)	1.90 (1.27–2.66)	1.95 (1.41–2.83)	1.99 (1.39–3.24)
Total cholesterol (mmol/L)	6.0 (5.5–7.0)	6.0 (5.1–6.9)	6.3 (5.6–7.3)	6.2 (5.3–6.9)
Microalbuminuria	14 (46.7)	104 (38.5)	173 (33.7)	150 (40.8)
Proteinuria	3 (10.0)	15 (5.6)	17 (3.3)	22 (6.0)
Clinical				
Body mass index (kg/m^2)	26.5 (23.6–29.9)	28.5 (25.9–31.1)	29.2 (25.7–33.6)	29.1 (26.6–31.9)
Hypertension	33 (89.2)	196 (69.8)	425 (78.9)	263 (69.6)
Behavioural				
Current smoking[2]	6 (16.2)	111 (39.5)	145 (27.1)	166 (43.9)
Functional level				
Sedentary physical activity[1]	31 (83.8)	67 (24.0)	148 (27.6)	81 (21.5)
Low mobility[2,3]	30 (81.1)	123 (43.9)	275 (51.4)	127 (33.7)
Home care[2]	21 (77.8)	41 (15.2)	97 (18.0)	32 (8.5)
Co-morbidity index[4]				
0	19 (51.4)	177 (63.0)	397 (73.7)	270 (71.4)
1	9 (24.3)	51 (18.2)	78 (14.5)	60 (15.9)
2	7 (18.9)	25 (8.9)	43 (8.0)	32 (8.5)
≥ 3	2 (5.4)	28 (10.0)	21 (3.9)	16 (4.2)
Randomization group				
Structured personal care	22 (59.5)	158 (56.2)	297 (55.1)	205 (54.2)

Notes: Values are numbers (percentages) or medians (inter-quartile range). [1]Based only on patients who consume warm main meals regularly (≥5 times per week). [2]Data from questionnaires to patients. [3]Low mobility is characterized by not being able to walk up or down the stairs from one floor to another without resting. [4]Charlson's comorbidity index is calculated on 10 years before time of diabetes diagnosis.

Discussion

Among women with a regular intake of warm main meals, infrequent involvement in cooking was associated with a higher risk of diabetes-related death and stroke. This association was not found in men. To our knowledge, no previous studies have explored the potential benefits of being involved in cooking among patients with T2DM.

Strengths and weaknesses of the study

This population-based study has several strengths. The patients are likely to be representative of the general Danish population of patients newly diagnosed with clinical T2DM at the time because of the well-defined background population in each general practice and the small number of exclusions and dropouts [17]. In addition, the study used established well-defined registry-based outcomes [18–20].

However, relatively few women were infrequently involved in cooking and their risk profile at diagnosis was poor (see Table I). Infrequent cooking is likely to be a proxy for poor health. For example, reduced functional level both causes inability to cook [23] and increases mortality and morbidity [15,16]. The analyses were extensively adjusted for potential confounders including several measures for comorbidity and functional level. Still, we cannot rule out the possibility that the results may be explained by residual confounding from disease severity and IADL. However, the observation that the effect of involvement in cooking levelled out when adjusting for the anticipated biochemical mediators of the effect of cooking on the outcomes indicates that cooking had a protective effect on glucose level, lipid profile, blood pressure etc. Other limitations of this study relate to the validation and reliance on self-reported cooking behaviour, the use of the pragmatic categoriza-

Table II. Mortality and morbidity during 19 years of follow-up according to frequency of involvement in cooking.

	No. of patients without the outcome at diagnosis Infrequent/ frequent cooking	No. of patients with outcome during 19 years of follow-up, n (%)		Absolute risk (events per 1000 patient years)		Hazard ratios[1] for infrequent versus frequent involvement in cooking						
		Infrequent cooking	Frequent cooking	Infrequent cooking	Frequent cooking	Model 1[2] Adjusted for possible confounders	p- value*	Interaction p-value**	Model 2[3] Further adjusted for possible biochemical mediators	p-value*	Interaction p-value**	n (Model 2)
All-cause mortality:												
Men	281/378	225 (80.1)	260 (68.8)	80.8	58.1	1.03 (0.85-1.25)	0.77	0.098	1.06 (0.87-1.28)	0.59	0.32	563
Women	37/539	34 (91.9)	349 (64.8)	147.9	51.3	1.39 (0.90–2.14)	0.14		1.32 (0.79–2.20)	0.30		482
Diabetes-related deaths:												
Men	281/378	136 (48.6)	166 (44.0)	48.8	37.1	0.97 (0.75–1.24)	0.79	0.032	0.96 (0.74–1.24)	0.76	0.23	561
Women	37/539	24 (64.9)	218 (40.6)	104.4	32.0	1.86 (1.03–3.35)	0.039		1.45 (0.68–3.08)	0.33		480
Any diabetes-related endpoint:												
Men	214/313	141 (65.9)	222 (70.9)	82.4	75.7	0.82 (0.65–1.04)	0.11	0.15	0.82 (0.65–1.04)	0.10	0.30	451
Women	23/457	16 (69.6)	325 (71.1)	150.7	71.0	1.34 (0.69–2.60)	0.38		1.19 (0.56–2.54)	0.66		405
Myocardial infarction:												
Men	238/348	80 (33.6)	131 (37.6)	34.4	33.2	0.79 (0.57–1.09)	0.15	0.083	0.78 (0.55–1.10)	0.15	0.13	500
Women	30/509	12 (40.0)	164 (32.2)	68.1	26.1	1.28 (0.64–2.58)	0.49		1.19 (0.56–2.54)	0.66		450
Stroke:												
Men	264/360	67 (25.4)	83 (23.1)	27.7	20.6	1.16 (0.82–1.64)	0.39	0.11	1.06 (0.74–1.52)	0.74	0.16	534
Women	30/520	7 (23.3)	108 (20.8)	39.6	17.2	2.47 (1.08–5.65)	0.033		2.38 (1.00–5.67)	0.050		464
Peripheral vascular disease:												
Men	278/375	14 (5.0)	25 (6.7)	5.1	5.7	0.97 (0.47–2.04)	0.94	0.57	1.11 (0.50–2.44)	0.80	0.62	558
Women	36/537	2 (4.6)	15 (2.8)	8.8	2.2	2.07 (0.13–33.42)	0.61		3.20 (0.13–76.23)	0.47		480
Microvascular disease:												
Men	281/377	32 (11.4)	60 (15.9)	11.9	14.3	0.83 (0.52–1.34)	0.45	0.79	0.75 (0.43–1.31)	0.31	0.88	562
Women	37/537	3 (8.1)	65 (12.1)	14.0	9.9	1.00 (0.15–6.51)	0.99		0.59 (0.05–7.80)	0.69		481

Notes: These multivariate analyses include patients who consume warm meals regularly (≥ 5 times per week). Infrequent cooking: < once time per week, frequent cooking: 2–7 times per week. [1]The hazard ratio (HR) is calculated in a Cox proportional hazard regression model. The corresponding 95% confidence interval (95% CI) and p-values are determined using a sandwich estimator for the variance to account for clustering of patients within practices. *Tests the effect of involvement in cooking within gender groups. **Tests whether the effect of involvement in cooking is different between gender groups. [2]Model 1: these analyses are adjusted for age, randomization group, education, living alone, residence, body mass index, hypertension, smoking habits, leisure-time physical activity, low mobility, home care, and Charlson's co-morbidity index. [3]Model 2: these analyses are additionally adjusted for diagnostic plasma glucose, fasting triglyceride, total cholesterol, microalbuminuria, and proteinuria.

tion of infrequent and frequent, and the lack of information about changes in cooking habits after diabetes diagnosis.

Interpretation of the results

Model 1 is considered the primary model and contains the relevant confounders for the most pertinent estimation of the effect of involvement in cooking on the outcomes. Model 2, additionally controlled for biochemical variables, is anticipated to mediate the association of interest. As expected, a possible protective effect of frequent cooking is explained by its positive effect on the levels of biochemical risk factors as mentioned earlier. The relatively low BMI among patients who were infrequently involved in cooking could relate to the obesity paradox, which argues that obesity and high BMI may reduce mortality in patients with T2DM [24,25].

This study considered involvement in cooking as an element of IADL and therefore functional level [14]. The relatively poor prognosis in women with infrequent planning, preparing, and/or serving of meals may be explained by the fact that (i) homemade food is perceived to be healthy [26], (ii) the activity of "cooking" is perceived as healthy [27, 28], or (iii) independent IADL, including cooking, is a proxy for good self-care [29]. This study, however, did not investigate the nutritional composition of the meals.

The gender difference found in this study is not easy to comprehend, as one would think that good self-care would benefit any patient with T2DM, man or women. The following interpretation can therefore only be assumed. To "not be involved in cooking" as a woman or as a man may reflect different things based on traditional gender roles. The responsibility for cooking lies primarily with the females in most households [7]. Therefore, inability to cook may well be a better indicator of disease severity in women than in men. If the findings of this study reflect residual confounding from disease severity rather than the healthy effect of cooking one's own food, women's responsibility for cooking may explain the gender differences found.

On the other hand, the explanation may also lie in the assumption that women cook healthier meals than men [7,10]. Women who are not involved in cooking may eat less healthy food prepared by their male spouse, or meals provided from home care services, ready meals, or other junk food. Males who do not cook often have a wife to cook healthy homemade food for them. This could contribute to explaining the trend found in this study, that men cooking infrequently experience a protective effect on adverse outcomes.

Clinical implications

When GPs meet infrequent cooking behaviour among their female patients newly diagnosed with T2DM, they should bear in mind that these patients may have a relatively high risk of an adverse outcome. These patients may be considered to be vulnerable and therefore GPs could consider paying special attention to the quality of diabetes treatment for this group of patients.

Conclusion

For patients newly diagnosed with T2DM who have a regular intake of warm main meals, infrequent involvement in cooking is associated with an increased risk of diabetes-related death and stroke in women, but not in men. GPs should consider paying special attention to the small, high-risk group of female patients with T2DM who report infrequent involvement in cooking. However, more research is needed to clarify whether the relation is causal or explained by confounding factors not adjusted for in the present study.

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Ethical approval

The Copenhagen and Frederiksberg Research Ethics Committee approved this study.

Declaration of interest

There are no conflicts of interest in connection with the paper. The authors alone are responsible for the content and writing of the paper.

References

[1] Beck-Nielsen H, Henriksen JE. [Type 2 diabetes in Denmark]. Ugeskr Laeger 2012;174:2132–8.

[2] Wandell PE. Quality of life of patients with diabetes mellitus: An overview of research in primary health care in the Nordic countries. Scand J Prim Health Care 2005;23:68–74.

[3] Nield L, Moore H, Hooper L, Cruickshank K, Vyas A, Whittaker V, et al. Dietary advice for treatment of type 2 diabetes mellitus in adults. Cochrane Database Syst Rev 2007;(3):CD004097.

[4] Pegklidou K, Nicolaou I, Demopoulos VJ. Nutritional overview on the management of type 2 diabetes and the prevention of its complications. Curr Diab Rev 2010;6:400–9.

[5] Thorsen T, Dalsted R. Rådgivning i almen praksis om alkohol, kost, motion, rygning. En litteraturgennemgang [Advising on alcohol, diet, physical exercise and smoking in general practice. A review]. Copenhagen: Viden- og dokumentationsenheden, Sundhedsstyrelsen; 2005.

[6] Kapur K, Kapur A, Ramachandran S, Mohan V, Aravind SR, Badgandi M, et al. Barriers to changing dietary behavior. J Assoc Physicians India 2008;56:27–32.

[7] Velsing Groth M, Fragt S. Danskernes kostvaner– Måltidsvaner, holdninger, sociale forskelle og sammenhæng med anden livsstil [Danish dietary habits – meal habits, attitudes, social differences and the association with other lifestyles] (English summary). Danish Food Administration, Institute of Food Research and Nutrition 2003;9.

[8] Seidel D, Crilly N, Matthews FE, Jagger C, Brayne C, Clarkson PJ. Patterns of functional loss among older people: A prospective analysis. Human Factors 2009;51:669–80.

[9] Poskiparta M, Kasila K, Kiuru P. Dietary and physical activity counselling on type 2 diabetes and impaired glucose tolerance by physicians and nurses in primary healthcare in Finland. Scand J Prim Health Care 2006;24:206–10.

[10] Haraldsdottir J, Holm L, H. Jensen J, Møller A. Danskernes kostvaner 1985, 2.Hvem spiser hvad? [Danish dietary habits 1985. 2. Who eats what?] (English summary). Copenhagen: National Food Agency 1987;154.

[11] Epinion, Madkulturen. DM i Hverdagsmad. Danskernes madkultur anno 2012 [The Danish Foodculture anno 2012], available at: http://dl.dropboxusercontent.com/u/748511/DM I HVERDAGSMAD/Ny identitet/9. Fakta om madkultur/DM_Danskernes_madkultur_NEW.pdf (accessed 4 September 2013).

[12] Velsing Groth M, Rosenlund Sørensen M, Biltoft-Jensen A, Matthiessen J, Kørup K, Fragt S. Danskernes måltidsvaner, holdninger, motivation og barrierer for at spise sundt 1995–2008 [Danish meal habits, attitudes, motivation and barriers for healthy eating 1995–2008] (English summary). Danish Food Administration, Technical University of Denmark; 2009.

[13] Godfrey CM, Harrison MB, Lysaght R, Lamb M, Graham ID, Oakley P. Care of self – care by other – care of other: The meaning of self-care from research, practice, policy and industry perspectives. Int J Evid Based Healthcare 2011;9:3–24.

[14] Healthcare: Instrumental activities of daily living (IADL), available at: http://www.healthcare.uiowa.edu/igec/tools/function/lawtonbrody.pdf (accessed 3 January 2014).

[15] Capistrant BD, Wang Q, Liu SY, Glymour MM. Stroke-associated differences in rates of activity of daily living loss emerge years before stroke onset. J Am Geriatr Soc 2013;61:931–8.

[16] Naeim A, Keeler EB, Reuben D. Perceived causes of disability added prognostic value beyond medical conditions and functional status. J Clin Epidemiol 2007;60:79–85.

[17] Hansen LJ, Siersma V, Beck-Nielsen H, de Fine Olivarius N. Structured personal care of type 2 diabetes: A 19 year follow-up of the study Diabetes Care in General Practice (DCGP). Diabetologia 2013;56:1243–53.

[18] Lynge E, Sandegaard JL, Rebolj M. The Danish National Patient Register. Scand J Public Health 2011;39:30–3.

[19] Helweg-Larsen K. The Danish Register of Causes of Death. Scand J Public Health 2011;39:26–9.

[20] Pedersen CB, Gotzsche H, Moller JO, Mortensen PB. The Danish Civil Registration System: A cohort of eight million persons. Dan Med Bull 2006;53:441–9.

[21] Befolkningen i kommunerne 1.januar 1983 [The population in the municipalities 1 January 1983]. Copenhagen: Statistics Denmark; 1983.

[22] Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. J Chronic Dis 1987;40:373–83.

[23] Seidel D, Brayne C, Jagger C. Limitations in physical functioning among older people as a predictor of subsequent disability in instrumental activities of daily living. Age Ageing 2011;40:463–9.

[24] Carnethon MR, De Chavez PJ, Biggs ML, Lewis CE, Pankow JS, Bertoni AG, et al. Association of weight status with mortality in adults with incident diabetes. JAMA 2012;308:581–90.

[25] Tseng CH. Obesity paradox: Differential effects on cancer and noncancer mortality in patients with type 2 diabetes mellitus. Atherosclerosis 2013;226:186–92.

[26] Cohen DA, Bhatia R. Nutrition standards for away-from-home foods in the USA. Obesity Reviews 2012;13:618–29.

[27] Wen X, Liang Y, Zhu J, Wu T. The effects of housework on the health of retired older adults: A preliminary investigation from the Tongji-Dongfeng cohort study, China. PloS one 2013;8:e57232.

[28] Archer E, Shook RP, Thomas DM, Church TS, Katzmarzyk PT, Hebert JR, et al. 45-year trends in women's use of time and household management energy expenditure. PloS one 2013;8:e56620.

[29] Backman K, Hentinen M. Factors associated with the self-care of home-dwelling elderly. Scand J Caring Sci 2001;15:195–202.

Supplementary material available online

Supplementary material, Appendix I–IV.