

ORIGINAL COMMUNICATION

Nutritional deficiency in Dutch primary care: data from general practice research and registration networks

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Objective: To explore incidence and prevalence rates of nutritional deficiency in adults in general practice.

Methods: Six Dutch general practice research and registration networks supplied incidence and prevalence rates of nutritional deficiency by the International Classification of Primary Care (ICPC) or 'E-list' labels ('loss of appetite, feeding problem adult, iron, pernicious/folate deficiency anaemia, vitamin deficiencies and other nutritional disorders, weight loss'). In case of disease-related nutritional deficiency, we asked whether this was labelled separately ('co-registered') or included in the registration of the underlying disease.

Results: 'Iron deficiency anaemia' had highest incidence (0.3–8.5/1000 person years), and prevalence rates (2.8–8.9/1000 person years). Nutritional deficiency was mostly documented in the elderly. In two networks 'co-registration' was additional, two only documented the underlying disease and two did not specify 'co-registration'. No clear difference was found between networks considering the difference in 'co-registration'.

Conclusion: Nutritional deficiency is little documented in general practice, and generally is not registered separately from the underlying disease.

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Introduction

Nutritional deficiency is a state of insufficient intake (eg loss of appetite, nausea), absorption (eg diarrhoea, decreased intrinsic factor), utilization (eg inflammation), tissue storage (eg protein), intrinsic production (eg vitamin D) and/or increased loss (eg vomiting, burns, menstruation) over time. Nutritional deficiency can be a micronutrient deficiency (eg iron, vitamins), and in advanced stages accompanied by macronutrient deficiencies (protein-energy malnutrition). Advanced nutritional deficiency can be quantified by muscle mass depletion or weight loss. It negatively influences quality of life (Larsson *et al*, 1995; Shoup *et al*, 1997; Mostert *et al*, 2000), and above all increases the risk of mortality (Wilson *et al*, 1989; Ryan *et al*, 1995; Anker *et al*, 1997; Schols *et al*, 1998; Landbo *et al*, 1999; Sullivan *et al*, 1999).

Cancer and chronic diseases, such as chronic obstructive pulmonary disease (COPD) and heart failure, are frequently accompanied by advanced nutritional deficiency, caused by a hyper-metabolic state, which may be aggravated by a reduced appetite, also referred to as cachexia (Anker & Coats, 1999; Schols, 2002).

Anorexia of ageing is an often described syndrome in the elderly, and together with a sedentary lifestyle it may lead to muscle depletion, called sarcopenia (Morley, 1997). For this reason elderly people, particularly when suffering from chronic diseases, are at increased risk for nutritional deficiency. We previously found in the literature, the prevalence rates for nutritional deficiency in general practice of 9–13% (chronically ill) and 0–12% (elderly) (van Wayenburg *et al*, 2005). However, only few studies were available and all had methodological flaws.

General practice research and registration networks (further referred to as 'networks') might be a source of data on prevalence and incidence. In the Dutch health-care structure patients are listed with one general practice (group), which provides their personal professional medical care, including referrals to medical specialists (Health Council of the Netherlands, 2004). Therefore, networks can establish a precise denominator for incidence and prevalence calculations. Currently, more than 80% of the general practitioners (GPs) use an electronic medical patient record in their daily practice (Hiddema-van de Wal *et al*, 2001). Conclusively, this is an excellent resource for networks.

The aim of this study was to explore incidence and prevalence rates of nutritional deficiency in adults (15 y and older) in Dutch general practice.

Methods

In October 2003, we sent a letter of invitation to the management of all 14 networks (Metsemakers, 1999); subsequently, we contacted them by telephone. Three networks had ceased to exist, two were unable to cover administration fees required to supply data, two networks were unable to provide the diagnostic labels required for this study, and one was declined for pragmatic reasons. Six networks were therefore included.

The classifications used in the participating networks, the International Classification of Primary Care (ICPC) or the 'E-list', are based on equal diagnostic criteria of the International Classification of Health Problems for Primary Care (ICHPPC) (Classification Committee of WONCA, 1984). From these classifications (van de Lisdonk *et al*, 1996) we compiled a list of nutrition deficiency-related symptoms and diagnoses: 'Loss of appetite, feeding problem adult, iron deficiency anaemia, pernicious/folate deficiency anaemia, vitamin deficiencies and other nutritional disorders, and weight loss'.

We requested incidence and prevalence rates (total, and subdivided into gender and preset age groups) of the

corresponding labels. The incidence rate was defined as the number of (patients with ≥ 1) 'new'-recorded episode(s) (or problem(s)) per 1000 patient years (at risk). The prevalence rate was defined as the number of (patients with ≥ 1) 'new' or 'still clinically relevant' episodes (or problems) per 1000 patient years (at risk). An episode is the period from the first presentation of the disease or health problem at the GP until the last contact.

Additionally we asked if, in case of disease-related nutritional deficiency (eg weight loss in patients with cancer), this was labelled separately ('co-registered') or included in the registration of the underlying disease.

In the Transition project and the 2nd National Study (NS2) 'co-registration' was additional. The Continuous Morbidity Registration (CMR) and the Registration Network Family Practices in Maastricht (RNH) document only the underlying diagnose (at the highest level of certainty), and the Registration Network Groningen (RNG) and the Registration Network University Family Practices, Leiden and its environs (RNUH-LEO) did not specify 'co-registration'.

Summary of the basic background of participating networks

(1) *Transition project* (Okkes *et al*, 1998, 2002), from 1985 to 1995, comprised 23 general practice(s) (groups) with 54 GPs in Amsterdam and the north of the Netherlands. Each GP collected data during a period of at least 1 y. The mean registration period was 2.4 y. Participating GPs order and label each encounter, the patient's reason for the encounter, the diagnoses, and the interventions. A diagnosis can be modified during the course of an episode.

(2) *The 2nd National Study (NS2)* (van der Linden *et al*, 2004; Westert *et al*, 2005) took place during May 2000–April 2002 in 104 general practice(s) (groups) with 195 GPs. The prevalence and incidence calculations are based on 96 practices all over the Netherlands. The study is a representative sample of Dutch GPs and their practice population (eg in age, gender, geographic distribution, urbanization, pharmacy containing practices). Recording of a recurring 'new' episode was only allowed after an interval of 28 days or more.

(3) *CMR* (van Weel, 1996, 2000; van de Lisdonk, 2003) started in 1971 and contains data collected by four general practice(s) (groups) with 10 GPs in Nijmegen and surroundings. From the start, a diagnosis is labelled according to the 'E-list' (Anonymous, 1963; Nederlands Huisartsen Genootschap, 1963) to guarantee tracking of morbidity over time ('longitudinal research').

(4) *Registration Network Family Practices in Maastricht (RNH)* (Metsemakers *et al*, 1992) was set up in 1988 and holds 22 general practice(s) (groups) with 65 GPs in the south of the Netherlands. They register on-going (no recovery expected), chronic (duration longer than 6 months), and recurrent health problems (more than three recurrences within a period of 6 months) and problems with a high impact on

daily functioning. Self-limiting minor illnesses are not registered.

(5) *RNG* (van der Werf *et al*, 1998; van der Veen & Meyboom-de Jong, 2004) was established in 1989 and includes 6 general practice(s) (groups) with on average 15 GP's in the north of the Netherlands.

(6) *Registration Network University Family Practices, Leiden and its environs (RNUH-LEO)* (de Waal, 1994) started in 1989 and contains four general practice(s) (groups) with in total 20 GPs.

Differences in participating networks

- The scientific mission; The Transition project and CMR are specifically grounded for research, and the NS2, RNH, RNG, RNUH-LEO provide a sampling frame by optimized standard electronic patient records.
- Agreement in coding morbidity within networks; The Transition project, NS2 and RNUH-LEO apply merely ICCPC-criteria (Classification Committee of WONCA, 1984), whereas the CMR, RNG and RNH supply feedback by (regular) meetings.
- All networks register episodes except the RNH, which documents chronic/recurrent episodes as problems.
- The registration of diverse patient-GP contacts, such as 'face to face' patient contacts (home and office visits) (all networks), telephone consultation (all, except the RNG), contact with the assistant (all, except the RNH and RNG), referrals (eg to the hospital) (all, except the RNH), diagnoses from the patient's contact with the specialist without the interference of the GP (eg first aid) (only the CMR), medication prescription resulting in episode labelling (all, except the CMR and RNH) and out of hours (eg shifts, holidays) (all networks).

Analyses

In the Transition project labels can be classified as 'certain' or 'uncertain'. Some presented labels are symptoms and for this reason relatively 'uncertain'—not objective or not totally matching the label inclusion criteria—therefore we analysed 'uncertain' as well as 'certain' labels. Additionally, we present the reason for encounter, only available for the Transition project, during the first contact with the GP (at start) and the reason for encounter during all contacts (total) expressed per 1000 patient years (at risk).

The presented rates for those aged 15 y and older were directly standardized for the Dutch population during the observation years.

Results

Figure 1 shows the distribution of the GPs from the included networks in the Netherlands. Table 1 summarizes population characteristics of each network. The overall population, in terms of age and gender distribution, of the six networks was

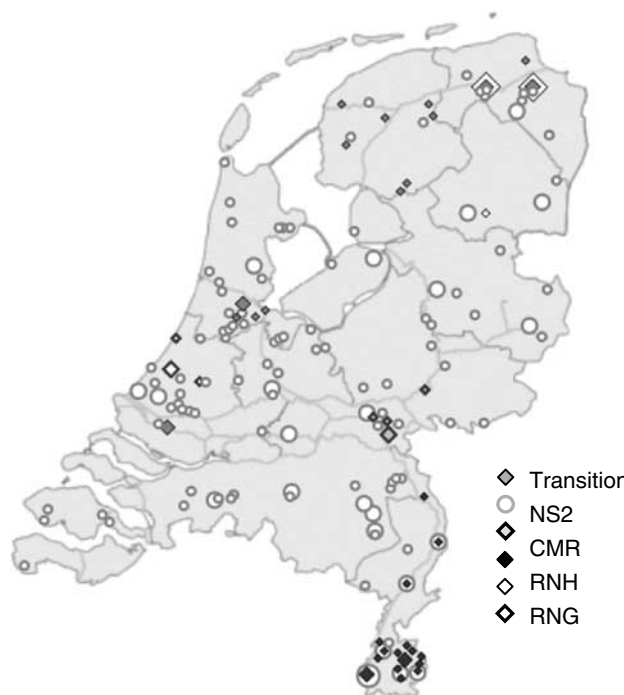


Figure 1 Distribution of the GPs participating in six networks in the Netherlands.

comparable to the Dutch population, with a slight over-representation of adults aged 25–44 y (Table 1) and women. The population of the Transition project contained the highest proportion of elderly, the majority of them women.

Table 2 presents the incidences. 'Iron deficiency anaemia and weight loss' were the most documented incidence rates, 0.3–8.5 and 0.1–2.9 episodes/problems per 1000 patient years, respectively. In decreasing order 'pernicious/folate deficiency anaemia, vitamin deficiency and other nutritional disorders, loss of appetite and feeding problem adult' have lower incidence rates, 0–1.9 episodes/problems per 1000 patient years.

Table 3 presents the prevalences. The most prevalent again were 'iron deficiency anaemia and pernicious/folate deficiency anaemia', 2.8–8.9 and 1.5–6.2 episodes/problems per 1000 patient years, respectively. These were followed by the prevalence of 'weight loss, vitamin deficiency and other nutritional disorders, loss of appetite and feeding problem adult', which varied from 0 to 3.2 episodes/problems per 1000 patient years.

The period of care for the registered episodes/problems (difference between incidence and prevalence) was longest for 'pernicious/folate deficiency anaemia' and least for weight loss. In all labels, except for 'feeding problem adult', the incidence and prevalence rates were highest among elderly people aged over 75 y (incidence 0–24.1 per 1000 patient years, prevalence 0–53.7/1000 patient years). Also eye-catching was the high occurrence of 'iron deficiency

Table 1 Characteristics of the populations (in patient years/year) of Dutch general practice networks, and the difference (%) between the gender and preset age groups with the total Dutch population during the observation period (network%–Statistics Netherlands%) (<http://www.cbs.nl/nl/cijfers/bevolkingspiramide/bevolkingspiramide.htm>)

		Transition project ^a	NS2 ^b	CMR	RNH	RNG	RNUH-LEO
Patient years	All ages	38 874	375 899	13 310	97 935	29 050	28 153
	15–24 y	5043 (–3.7)	46 549 (0.6)	1262 (–2.9)	11 284 (–0.8)	3591 (–0.1)	3641 (1.2)
	25–44 y	12 565 (–1.1)	121 241 (1.3)	4456 (3.6)	30 384 (–1.2)	10 339 (3.9)	9399 (2.8)
	45–64 y	7434 (–3.2)	91 788 (–0.7)	3337 (0.3)	25 985 (1.1)	7167 (–1.8)	7319 (1.0)
	65–74 y	4412 (4.4)	26 907 (–0.5)	981 (–0.1)	8699 (1.4)	1768 (–2.1)	1576 (–2.4)
	75+ y	3361 (3.6)	21 013 (–0.7)	710 (–0.9)	5775 (–0.5)	1883 (0.1)	1174 (–2.5)
Gender	♂ % (15+)	47.0 (–2.1)	49.3 (0.2)	49.1(0.1)	48.4 (–0.7)	48.3 (–0.8)	49.6 (0.5)

^aTotal patient years divided by the mean registration period (2.4y).

^bThe 'mid-time' population (based on the mean of the population at start and at the end of the study period concerning size, age, gender and insurance type). CMR: Continuous Morbidity Registration; RNH: Registration Network Family Practices; RNG: Registration Network Groningen; RNUH-LEO: Registration Network University Family Practices, Leiden and its environs; NS2: 2nd National Study.

anaemia' in fertile women. No clear difference in incidence and prevalence rates were identifiable between networks, considering the difference in 'co-registration'.

The reason for encounter rates (at start and total) were equal or higher than the incidence and prevalence rates for all nutritional deficiency related symptoms ('loss of appetite, feeding problem adult, and weight loss'), but lower for the related diseases: 'iron, pernicious/folate deficiency anaemia and vitamin deficiency and other nutritional disorders' (0.0–4.7 per 1000 patient years). It becomes clear that patients, during follow-up of their episodes, present their reason for visit more often as a diagnosis ('iron and pernicious/folate deficiency anaemia').

Discussion

Iron deficiency anaemia and weight loss were the most reported incidence rates of nutritional deficiency (0.3–8.5 and 0.1–2.9 episodes/problems per 1000 patient years, respectively). Patients present weight loss, a symptom as well as a diagnostic tool for advanced nutritional deficiency, more often than the GP documents, as in secondary prevention. However, obesity and unintentional weight loss, of more than 10% in half a year (Bokhorst-de van der Schueren *et al*, 1997), might have a future in primary prevention.

The substantially lower incidence rate, as compared to prevalence rate, for 'pernicious anaemia', indicates that after the diagnosis it continues to be a clinically relevant problem as can be expected for a chronic disease. To a lesser degree this can be observed in iron deficiency anaemia and weight loss. The 'short' course can be explained by the fact that patients 'recover' quickly or die within a short period of time.

Comparison to the literature

The few empirical data on nutrition deficiency in primary care reported percentages of 0–13% (van Wayenburg *et al*,

2005), which suggests a (much) higher impact of morbidity than came forward from the data of the networks presented. The elderly aged 75 y and older could be clearly identified as a population at risk for nutritional deficiency, which is in line with the literature (de Groot *et al*, 1999).

Obesity, another nutritional disorder (not included here), seems to be a chronic condition, as indicated by the difference in incidence and prevalence in the CMR (2 and 42, respectively) (van Weel, 1997), that is in contrast to nutrition deficiency in this study. Literature indicates a higher mortality risk for the undernourished patient (Wilson *et al*, 1989; Ryan *et al*, 1995; Anker *et al*, 1997; Schols *et al*, 1998; Landbo *et al*, 1999; Sullivan *et al*, 1999) and in particularly the elderly have a diminished capability to 'recover' from weight loss (Fiatarone *et al*, 1994; Roberts *et al*, 1994).

Methodological reflections

'Weight loss' can be interpreted as intentional (eg by a reducing diet) and unintentional (eg in cancer patients). Intentional weight loss is not an indicator for undernutrition and can therefore cause misclassification bias, although the ICCPC-criteria refer to weight loss/cachexia.

There are clear differences between the six networks with regard to their scientific mission, which would explain some variation in recording methods. Most obvious is the low recording rate in the RNH, especially for the incidence, explained by the limitation to record chronic/recurrent episodes.

Particularly important in this study was the question whether disease-related nutritional deficiency was labelled separately ('co-registered') or included in the registration of the underlying disease. Surprisingly, we did not find higher prevalence and incidence rates in the Transition project and NS2, compared to the other networks. This might indicate that GPs register nutritional deficiency indirectly in the 'causal' (chronic) disease, and not separately, surprisingly also in the case of iron deficiency anaemia. This explains

Table 2 Incidence (and reasons for encounter rate (at start)^a) (n/1000 patient years) of registered nutritional deficiency related diagnoses for gender and preset age groups in Dutch general practice networks

ICPC/E-list label (CMR)	Diagnose	Age	Transition project ^{b,a}		NS2 ^{b,c}		CMR ^b		RNH ^d		RNG ^d		RNUH-LEO ^b	
			1 Feb. 1985–1 Jan. 1995		1 May 2000–30 April 2002		1 Jan. 1999–31 Dec. 2003		1 May 2000–30 April 2002		1 Jan. 1999–31 Dec. 2003		1 Aug. 1998–1 Aug. 2003	
			Years	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
T03/2920	Loss of appetite/anorexia ecl. anorexia nervosa	15–24	0.7 (1.9)	1.1 (2.2)	0.1	0.5	0.0	0.0	0.0	0.1	0.0	0.4	0.2	0.3
		25–44	0.4 (0.6)	0.8 (1.6)	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.2	0.1	0.2
		45–64	0.4 (1.0)	0.3 (0.8)	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1
		65–74	0.2 (1.5)	0.7 (2.2)	0.3	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.5	0.2
		75+	0.3 (2.0)	1.6 (4.7)	0.7	1.0	0.8	0.0	0.0	0.0	0.6	1.1	1.0	1.6
		15+ ^e	0.6 (1.5)		0.2		0.0		0.0		0.2		0.3	
T05/1061	Feeding problem adult/nutritional disorders	15–24	0.2 (0.2)	0.8 (0.8)	0.1	0.5	0.0	0.0	0.0	0.0	0.1	0.6	0.0	0.6
		25–44	0.1 (0.0)	0.3 (0.1)	0.0	0.3	0.1	0.3	0.0	0.0	0.1	0.6	0.2	0.5
		45–64	0.0 (0.1)	0.1 (0.0)	0.0	0.1	0.2	0.0	0.1	0.0	0.1	0.3	0.2	0.2
		65–74	0.0 (0.0)	0.3 (0.0)	0.2	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.0	0.5
		75+	0.0 (0.3)	0.8 (1.0)	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.3
		15+ ^e	0.2 (0.2)		0.2		0.2		0.0		0.3		0.3	
B80/1111	Iron deficiency anaemia/iron deficiency anaemia	15–24	0.7 (0.0)	12.6 (2.7)	0.3	4.7	0.3	8.5	0.0	0.0	1.1	11.4	0.9	4.5
		25–44	0.3 (0.2)	14.5 (2.2)	0.4	7.1	0.2	9.8	0.0	0.2	0.8	15.6	0.3	7.4
		45–64	1.1 (0.1)	7.7 (1.1)	0.8	5.7	1.6	8.0	0.3	0.4	2.2	9.4	1.1	5.3
		65–74	3.8 (0.4)	8.5 (0.7)	2.7	4.3	3.5	1.5	0.5	0.9	9.3	10.7	4.5	4.1
		75+	10.8 (1.0)	16.8 (2.2)	9.2	10.5	7.0	19.0	1.7	1.6	24.1	24.0	10.2	14.7
		15+ ^e	6.8 (1.0)		3.9		5.3		0.3		8.5		4.2	
B81/1101 & 1109	Pernicious or folate deficiency anaemia/pernicious anaemia & other deficiency anaemia	15–24	0.0 (0.0)	0.0 (0.0)	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.5	0.3	0.3
		25–44	0.0 (0.0)	0.3 (0.1)	0.0	0.4	0.0	0.1	0.0	0.1	0.2	1.2	0.3	0.9
		45–64	0.2 (0.0)	0.5 (0.0)	0.2	0.5	0.4	0.1	0.1	0.0	1.0	1.6	0.3	1.0
		65–74	0.6 (0.0)	1.6 (0.2)	0.9	1.0	1.3	0.8	0.1	0.2	2.8	3.9	2.9	3.4
		75+	1.7 (0.0)	3.5 (0.4)	3.0	2.5	3.9	0.4	0.3	0.8	6.8	6.8	12.7	15.7
		15+ ^e	0.5 (0.0)		0.5		0.3		0.1		1.5		1.9	
T91/0921	Vitamin deficiencies & other nutritional disorders/vitamin deficiency	15–24	0.2 (0.0)	0.3 (0.2)	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.1
		25–44	0.1 (0.0)	0.1 (0.0)	0.0	0.4	0.0	0.9	0.0	0.1	0.0	0.2	0.3	0.7
		45–64	0.5 (0.0)	0.2 (0.0)	0.2	0.4	0.1	0.4	0.1	0.2	0.2	0.1	0.5	0.7
		65–74	0.4 (0.2)	1.4 (0.0)	0.6	0.8	1.3	0.8	0.0	0.0	0.0	0.0	1.9	2.2
		75+	1.7 (0.0)	1.6 (0.2)	0.5	1.3	2.3	4.9	0.0	0.3	0.3	1.6	3.9	6.5
		15+ ^e	0.4 (0.0)		0.3		0.7		0.1		0.2		1.0	
T08/4570	Weight loss	15–24	1.5 (1.9)	4.1 (4.8)	1.3	2.3	0.6	0.6	0.0	0.2	1.8	2.0	1.3	3.3
		25–44	1.3 (1.7)	2.9 (3.6)	0.7	1.9	0.4	0.9	0.0	0.0	0.8	2.2	1.0	2.1
		45–64	3.1 (3.7)	2.5 (3.6)	1.0	1.7	0.2	0.1	0.0	0.2	1.5	1.9	2.2	2.4
		65–74	2.9 (4.0)	5.0 (7.1)	3.3	2.7	3.1	0.8	0.1	0.2	2.8	3.3	2.9	3.2
		75+	4.1 (5.4)	7.6 (8.4)	4.5	5.1	4.7	4.9	0.5	0.1	4.3	4.9	12.7	9.4
		15+ ^e	2.9 (3.6)		1.8		0.9		0.1		2.0		2.7	

^aReasons for encounter rate (at start).

^bThe numerator is the number of episodes.

^cThe denominator is the 'mid-time' population (based on the mean of the population at start and at the end of the study period concerning size, age, gender and insurance type).

^dThe numerator is the number of patients with ≥1 'new' episode/ problem.

^eStandardized (n/1000) for the Dutch population during the observation years.

ICPC: International Classification of Primary Care; CMR: Continuous Morbidity Registration; RNG: Registration Network Groningen; RNH: Registration Network Family Practices; RNUH-LEO: Registration Network University Family Practices Leiden and its environs; NS2: 2nd National study.

Table 3 Prevalence (and reasons for encounter rate (total)^a) (*n*/1000 patient years) of registered nutritional deficiency related diagnoses for gender and pre-set age groups in Dutch general practice networks

ICPC/E-list label (CMR)	Diagnose	Age	Transition project ^b		NS2 ^{c,d}		CMR ^b		RNH ^{c,e}		RNG ^c		RNUH-LEO ^b	
			1 Feb. 1985–1 Jan. 1995		1 May 2000–30 April 2002		1 Jan. 1999–31 Dec. 2003		1 May 2000–30 April 2002		1 Jan. 1999–31 Dec. 2003		1 Aug. 1998–1 Aug. 2003	
			years	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
T03/2920	Loss of appetite/anorexia ecl. anorexia nervosa	15–24	0.9 (2.1)	1.1 (3.7)	0.2	0.6	0.0	0.0	0.4	0.1	0.0	0.4	0.2	0.3
		25–44	0.4 (1.0)	0.8 (2.2)	0.2	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.1	0.2
		45–64	0.4 (1.7)	0.5 (1.6)	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1
		65–74	0.2 (2.5)	0.9 (5.3)	0.6	0.4	0.0	0.0	0.0	0.6	0.3	0.0	0.5	0.2
		75+	1.0 (5.4)	2.5 (6.6)	1.3	1.6	0.8	0.0	0.0	0.3	0.6	1.1	1.0	1.8
		15+ ^f	0.7 (2.4)		0.3		0.0		0.1		0.2		0.3	
T05/1061	Feeding problem adult/nutritional disorders	15–24	0.2 (0.2)	1.1 (1.1)	0.1	0.6	0.0	0.0	0.0	0.1	0.1	0.6	0.0	0.7
		25–44	0.1 (0.0)	0.3 (0.1)	0.1	0.4	0.1	0.3	0.1	0.2	0.1	0.6	0.3	0.6
		45–64	0.0 (0.4)	0.1 (0.0)	0.1	0.2	0.2	0.0	0.3	0.2	0.1	0.3	0.2	0.4
		65–74	0.2 (0.2)	0.3 (1.0)	0.3	0.1	0.4	0.8	0.1	0.1	0.0	0.0	0.0	0.5
		75+	0.3 (1.4)	1.2 (2.0)	0.4	0.9	0.0	0.0	0.0	0.2	0.0	0.3	0.5	0.5
		15+ ^f	0.3 (0.4)		0.3		0.2		0.2		0.3		0.4	
B80/1111	Iron deficiency anaemia/iron deficiency anaemia	15–24	1.0 (0.2)	14.2 (2.9)	0.7	0.3	0.3	8.5	0.1	1.0	1.1	11.9	1.0	5.3
		25–44	0.5 (0.2)	16.1 (2.8)	0.6	0.9	0.2	10.0	0.3	2.7	0.8	16.4	0.3	11.0
		45–64	1.2 (0.2)	10.9 (1.9)	1.7	1.2	1.9	8.6	1.5	6.2	2.2	10.0	1.2	9.6
		65–74	6.1 (1.9)	14.3 (5.2)	6.8	3.0	5.3	1.5	2.7	4.8	9.6	11.1	9.5	5.4
		75+	19.7 (6.4)	30.7 (13.5)	21.7	5.1	8.6	21.2	7.2	9.5	25.6	25.4	17.1	24.3
		15+ ^f	8.9 (2.2)		8.3		5.7		2.8		8.9		6.5	
B81/1101 & 1109	Pernicious or folate deficiency anaemia/pernicious anaemia & other deficiency anaemia	15–24	0.0 (0.0)	0.0 (0.0)	0.0	0.6	0.0	0.0	0.0	0.1	0.1	0.5	0.5	0.7
		25–44	0.1 (0.1)	0.7 (0.1)	0.3	0.4	0.0	0.5	0.2	0.6	0.2	1.3	0.5	2.1
		45–64	0.6 (0.0)	1.3 (0.0)	1.3	0.2	0.8	1.5	0.6	1.5	1.1	1.7	2.1	4.4
		65–74	2.3 (2.8)	7.1 (4.1)	5.0	0.1	5.3	3.4	2.5	3.2	3.3	4.5	18.0	11.0
		75+	6.8 (7.9)	13.3 (12.3)	16.6	0.9	15.6	6.2	9.9	10.2	7.1	7.8	53.7	39.5
		15+ ^f	1.6 (0.8)		2.8		1.6		1.5		1.7		6.2	
T91/0921	Vitamin deficiencies & other nutritional disorders/vitamin deficiency	15–24	0.3 (0.0)	0.3 (0.2)	0.1	0.3	0.0	0.3	0.2	0.0	0.0	0.1	0.1	0.1
		25–44	0.2 (0.0)	0.2 (0.0)	0.1	0.9	0.0	1.5	0.3	0.6	0.0	0.2	0.5	1.2
		45–64	0.8 (0.0)	0.2 (0.0)	0.6	1.2	0.2	1.6	0.4	0.4	0.2	0.1	1.2	1.4
		65–74	0.6 (0.2)	1.6 (0.0)	2.1	3.0	3.1	6.1	1.3	1.0	0.0	0.0	4.2	6.3
		75+	1.7 (0.0)	2.2 (0.2)	5.2	5.1	11.7	11.9	1.3	2.2	0.3	1.6	10.2	12.6
		15+ ^f	0.5 (0.0)		1.1		1.9		0.6		0.2		2.1	
T08/4570	Weight loss	15–24	2.1 (2.6)	4.1 (5.1)	1.8	2.8	0.6	0.6	0.2	0.1	1.8	2.0	1.4	3.4
		25–44	1.3 (2.0)	3.2 (4.6)	0.9	2.3	0.4	0.9	0.1	0.5	0.8	2.2	1.0	2.4
		45–64	3.2 (5.1)	3.0 (5.2)	1.4	2.3	0.2	0.1	0.3	0.4	1.5	1.9	2.5	2.7
		65–74	3.1 (4.8)	5.0 (9.1)	4.1	3.4	3.1	0.8	0.9	0.7	2.8	3.3	3.2	3.9
		75+	5.1 (8.1)	9.4 (12.7)	7.3	8.0	4.7	4.9	1.3	1.0	4.3	4.9	15.1	11.5
		15+ ^f	3.2 (4.7)		2.4		0.9		0.4		2.0		3.1	

^aReasons for encounter rate (total).^bThe numerator is the number of episodes.^cThe numerator is the number of patients with ≥ 1 episode/problem.^dThe denominator is the 'mid-time' population (based on the mean of the population at start and at the end of the study period concerning size, age, gender and insurance type).^ePoint-prevalence.^fStandardized (*n*/1000) for the Dutch population during the observation years.

ICPC: International Classification of Primary Care; CMR: Continuous Morbidity Registration; RNG: Registration Network Groningen; RNH: Registration Network Family Practices; RNUH-LEO: Registration Network University Family Practices Leiden and its environs; NS2: 2nd National study.

the lower reported prevalence expected from nutrition deficiency directed studies, besides methodological aspects (eg the retrospective nature of this study).

Considering the severe consequences, delayed wound healing (Deitch, 1995; Mathus-Vliegen, 2004), deterioration of muscle function (Engelen *et al*, 1994; Miyagi *et al*, 1994), impaired immune function (Field *et al*, 2002), longer hospital stays (Naber *et al*, 1997) and a higher morbidity risk, it would be advisable to co-register nutritional deficiency to ensure optimal treatment and good management (eg in referral letters to the hospital).

Conclusion

The incidence of nutrition deficiency as found in networks seems to be low in general practice. However, it is in all probability only the tip of the iceberg of what GPs encounter. In contrast to obesity, GPs encounter nutrition deficiency in the context of other morbidity. There is a need for better insight, and on the basis of this review it is recommended to seek empirical data in an in-depth analysis of patients with chronic diseases or cancer in general practice.

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