Socioeconomic factors influencing participation in and drop-out from disease management programs for Diabetes Mellitus and Cardiovascular Risk Management in Almelo

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Abstract

Much research is carried out to determine the relation between socioeconomic status (SES) and health and access to healthcare. Common conclusion of the previous researches done is that lower SES individuals have worse health status, experience worse health and experience reduced access to healthcare. The incidence and prevalence of chronic diseases are higher among lower SES individuals than among higher SES individuals. Since lower SES individuals will have lower health literacy and worse lifestyle, it is important for these individuals to be supervised by their GP in order to manage their disease(s) well. This research will focus on the disease management programs for diabetes mellitus (DM) and cardiovascular risk management (CVRM), since these diseases are more common among lower SES individuals and lifestyle factors play an important role in the development of the diseases. It is not known whether lower SES individuals experience a reduced access in the disease management programs for DM and CVRM and if the higher SES and lower SES patients included in the program differ on patient characteristics as age, age at onset and BMI. Both the enrolment and drop-out of the disease management programs for DM and CVRM and the characteristics of the patients included in this programs will be determined in this study. This knowledge may help better guide the delivery of interventions in the disease management programs for DM and CVRM. In turn, this can lead to a lower burden of these diseases with better self-management. All of this is determined in the light of Almelo, a city which has some postal codes with a very low SES and some postal codes with a high SES. Data is extracted from the database of FEA, a federation for cooperative GPs in Almelo and is analysed with descriptive statistics in SPSS. Mann-Whitney U test is carried out to determine if there is a relation between SES and drop-out of the disease management programs, age, age at onset and BMI. It is shown that there is no significant relation between SES and drop-out of the disease management programs. The rate of enrolment was higher among the lower SES individuals in the DM disease management program, in the CVRM disease management the rate of enrolment was higher among the higher SES individuals, although not significantly. On patient characteristics it appears that lower SES individuals included in the DM program have a significantly higher BMI than higher SES individuals included. In the CVRM program it appeared that lower SES individuals participating because of CVD were significantly younger when included in the program than higher SES individuals. For patients included because they have an increased vascular risk a significant relation between SES and age, age at onset and BMI was found. All in all, these findings correspond with the large body of knowledge that is present. It is recommended for practice to better guide the interventions set up for lower SES individuals and also use other channels to reach these individuals than the GP. For further research it is recommended to further explore on

which levels discrepancies between lower and higher SES individuals exists and how this affects the access to healthcare.

Keywords: socioeconomic status (SES), diabetes mellitus (DM), cardiovascular diseases (CVD), enrolment, participation, drop-out, disease management program (DMP)

Summary

In Dutch

Er is veel onderzoek gedaan naar de relatie tussen sociaaleconomische status (SES), gezondheid en toegang tot de zorg. De gedeelde conclusie die hieruit getrokken kan worden is dat personen met een lagere SES een slechtere gezondheid hebben en ervaren. Tevens ervaren zij vaak ook barrières in de toegang tot de zorg. De incidentie en prevalentie van chronische ziekten is hoger onder personen met een lagere SES dan onder personen met een hogere SES. Het is belangrijk voor personen met een lagere SES dat zij goed begeleidt worden door hun huisarts in het onder controle houden van de ziekte, aangezien zij vaker een lagere 'health literacy' en een slechtere levensstijl hebben. Deze studie richt zich op de ketenzorgprogramma's voor diabetes mellitus (DM) en cardiovasculair risicomanagement (CVRM), aangezien deze ziekten meer voorkomen onder lagere SES personen en levensstijlfactoren een belangrijke rol spelen in de ontwikkeling van deze ziekten. Het is niet bekend of personen met een lagere SES ook een verminderde toegang tot zorg ervaren binnen deze ketenzorgprogramma's en of personen met een lagere SES participerend in het ketenzorgprogramma verschillen van personen met een hogere SES op basis van leeftijd, leeftijd van diagnose en BMI. In dit onderzoek zullen de inclusie- en exclusiegraad van de ketenzorgprogramma's DM en CVRM berekend worden voor personen met een lagere SES en voor personen met een hogere SES. Tevens zal onderzocht worden of de lagere SES personen verschillen op basis van leeftijd, leeftijd ten tijde van diagnose en BMI van de hogere SES personen. De kennis die dit oplevert kan helpen in het leveren van beter afgestemde interventies in deze ketenzorgprogramma's. Beter zelfmanagement kan leiden tot een lagere belasting van deze ziekten op het zorgsysteem. De studie is uitgevoerd binnen Almelo, een stad die zowel postcodegebieden met een zeer lage SES kent als postcodegebieden met een hogere SES dan het Nederlands gemiddelde. De data zoals gebruikt in deze studie is afkomstig van de database van FEA (Federatie Eerstelijnszorg Almelo e.o.). De data is geanalyseerd met behulp van SPSS. Een Mann-Whitney U test is uitgevoerd om te bepalen of er een relatie is tussen SES en de exclusie uit een ketenzorgprogramma, leeftijd, leeftijd ten tijde van diagnose en BMI. Hieruit blijkt dat er geen significante relatie bestaat tussen SES en de exclusie uit een ketenzorgprogramma. De participatiegraad onder lagere SES personen was hoger in het DM ketenzorgprogramma dan de participatiegraad onder hogere SES personen. In het CVRM ketenzorgprogramma was de participatiegraad onder hogere SES personen hoger dan onder lagere SES personen. Deze relaties bleken niet significant. Op het gebied van patiëntkarakteristieken bleek dat personen met een lagere SES in het DM ketenzorgprogramma een significant hogere BMI hadden dan personen met een hogere SES. Binnen het CVRM ketenzorgprogramma voor

individuen die participeren in dit programma vanwege hart- en vaatziekten (HVZ) bleek het dat lagere SES personen significant jonger waren ten tijde van diagnose dan hogere SES individuen. Voor patiënten die participeren in het CVRM ketenzorgprogramma vanwege verhoog vasculair risico (VVR) bleek er een significante relatie tussen SES en alle patiëntkarakteristieken (BMI, leeftijd, leeftijd ten tijde van diagnose) gemeten te bestaan. De resultaten zoals gevonden in deze studie komen overeen met de reeds bekende resultaten beschreven in de literatuur. Een aanbeveling die gemaakt kan worden voor de praktijk is dat de interventies opgezet voor lagere SES personen beter begeleid kunnen worden en dat deze interventies ook via andere kanalen dan de huisarts bij de patiënt moeten komen. In toekomstig onderzoek zou er gekeken kunnen worden naar het niveau in gezondheid en zorg waarop er verschillen bestaan tussen lagere en hogere SES individuen en hoe deze verschillen de toegang tot zorg bepalen.

Introduction

In the past decades mortality rates have fallen sharply and life expectancy has increased, especially among higher socioeconomic status (SES) individuals. This development was less sharply among lower SES individuals (1). Instead, the difference between higher and lower SES individuals in health and healthcare would even have increased in the past decades (1) (2). SES is an important factor underlying three determinants of health: health care, environmental exposure and health behaviour (3). In the past decades much research has been carried out which showed that lower SES individuals make more use of health care services than their wealthier counterparts, however, controlling for health status it appears that higher SES individuals make more use of health care (1) (4) (5) (6). Furthermore, lower SES individuals are less likely to use preventive care than higher SES individuals (7)

Socioeconomic status in the Netherlands and in Almelo

SES is the combination of the economic and social status of individuals. The three most widely accepted indicators for SES are education, income and occupation (8) (9). The SES per region in the Netherlands is visible in the figure below. The regions which are coloured red have the lowest SES, the regions which are coloured white have the highest SES. The lowest SES regions in the Netherlands are located in the North and North East alongside the German border and in the cities.

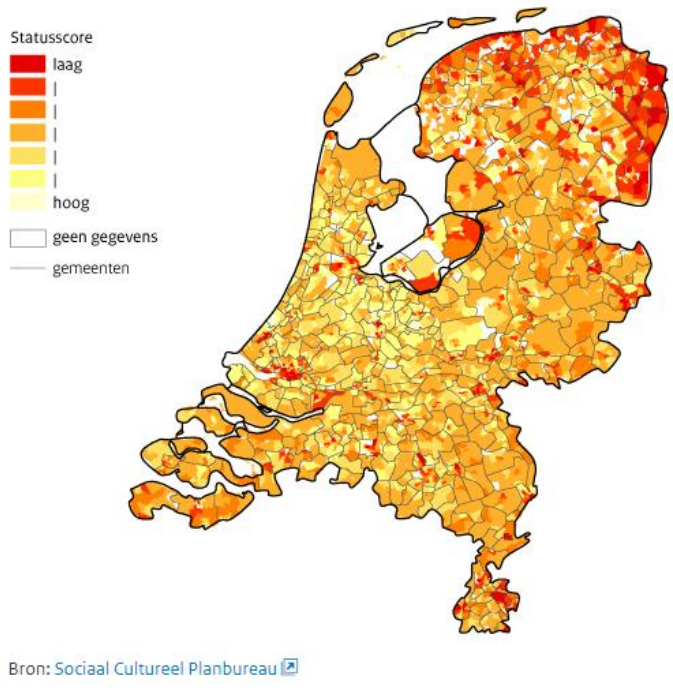

Figure 1: Socioeconomic Status in the Netherlands. (10)
Red coloured regions have a low SES, white coloured regions have a high SES.

Another city in the Netherlands in which there are large variations in SES is Almelo. Almelo has some postal codes which score quite similar to the mean SES score in Twente (surrounding municipalities of Almelo) and there are also several postal codes which score (far) below the mean of Twente (11) (12) (13) (14) (15) (16) (17) (18). In figure 2, the SES scores for 2010, 2014 and 2016 are given per postal code in Almelo. This figure shows that there are only two postal codes in Almelo which have a SES score above 0, all other postal codes have a SES score which is below 0. Outfitter in the SES score is postal code 7605 with a SES-score of -6, 11 in 2016.

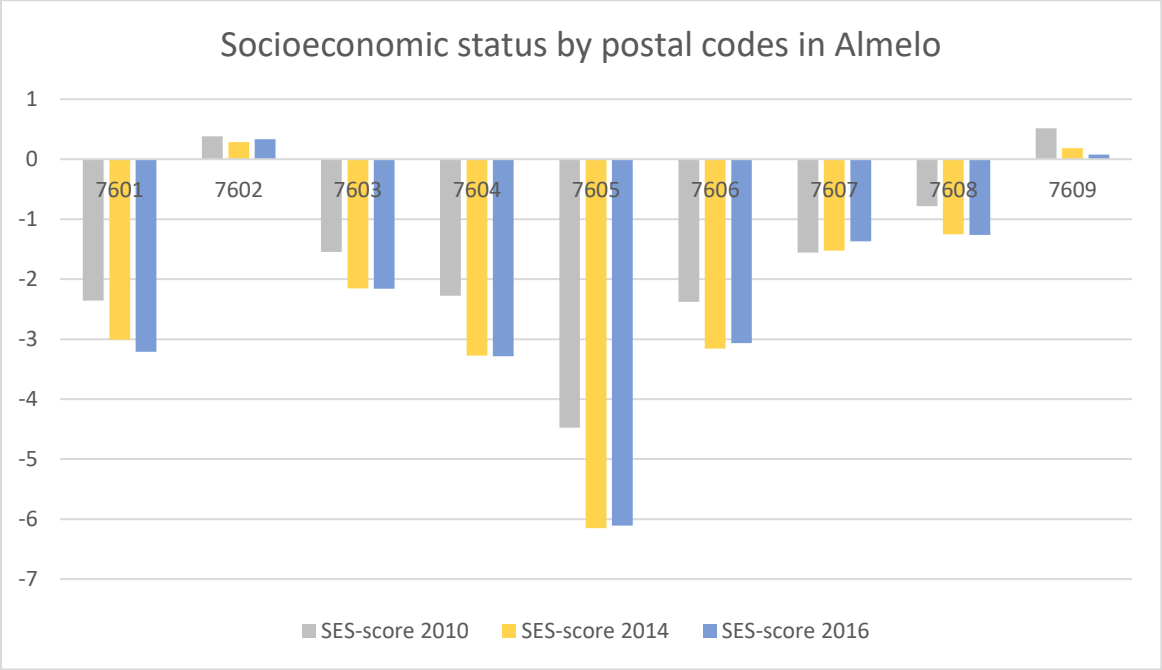

Figure 2: Socioeconomic status by postal codes in Almelo in 2010, 2014 and 2016 (19).

Another example of the differences between the postal codes in Almelo is the livelihood situation. The livelihood situation in postal codes 7605 and 7606 was in 2014 entitled as 'weak', three postal codes had a livelihood situation which was 'ample' (7601,7604 and district 'Binnenstad' in postal code 7607), four postal codes had a 'good' livelihood situation (7602 7603,7608,7609), district 'Hofkamp' in postal code 7607 had a 'very good' livelihood situation (20). Based on the SES scores and the livelihood situation it appears that postal codes 7602 and 7609 score high on SES and are good postal codes to live in. The postal codes 7605 and 7606 score worse on SES and are less optimal postal codes to live in. The study of Haan et al. stated that living in disadvantaged neighbourhoods was a more powerful determinant for mortality than socioeconomic determinants, as income and education, are (21). In Belgium, Lagasse found that despite controlling for socioeconomic determinants, some regions had higher mortality than others (22). Individuals of lower SES live mostly together in disadvantaged neighbourhoods.

Socioeconomic status affecting health

A lower SES, as is the case in postal codes 7605 and 7606, affects the overall health status of individuals. A lower SES results in a decreased life expectancy (23); individuals who only have finished primary school live seven years shorter than individuals with a degree of university (of applied sciences). Without physical limitations the life expectancy can differ 15 years for individuals of lower SES compared to individuals of higher SES (24). Furthermore, a lower status can result in increased prevalence of various illnesses and diseases such as diabetes, hypertension, obesity and HIV (24) (25) (1). Besides that lower SES individuals have more health problems, their experienced health is also lower (24). Women of lower SES have also a higher chance of preterm birth, maternal mortality and pregnancy obesity which can lead to complications as caesarean delivery, induced preterm birth and infant anomalies (26). Furthermore, the rate of teen pregnancies and unintended pregnancies is higher among women of lower SES than among women of a higher status (4) (27) (28) (29). Unhealthy behaviours are also more common among lower SES individuals. Examples of these unhealthy behaviours are smoking, taking breakfast less than 5 days a week and watching television more than 2 hours a day.

Diabetes and cardiovascular diseases (CVD) are both disease which are sensitive to lifestyle factors, besides heredity which plays an important role in the development of the disease (24) (1). In literature, the association between SES and chronic diseases as diabetes is described. Robbins et al. concluded that there is an inverse relationship between diabetes and SES, especially among women. This relation between diabetes and SES is also visible among men, however, less consistent (30) (31). Besides diabetes there is also an inverse relation between SES and CVD risk factors, especially hypertension. Low SES is related to both incidence and prevalence of hypertension (61). Figure 3 shows the prevalence of chronic diseases in Almelo, Twente and the Netherlands, respectively. It can be seen that the low SES postal codes do have more inhabitants with a chronic disease, especially DM and CVD are more apparent in the low SES areas than in Twente and the Netherlands. Looking at COPD, it appears that in low SES areas this is also more apparent than in higher SES areas, although the difference between higher and low SES areas is smaller for COPD than for DM and CVRM. The amount of individuals with 2 chronic conditions is higher in Almelo than in Twente and the Netherlands, but between the higher and low SES areas in Almelo there is not a difference. However, there is a difference when looking at 3 or more chronic conditions per individual. In the low SES areas there are more individuals who have 3 or more chronic conditions than in the higher SES areas.

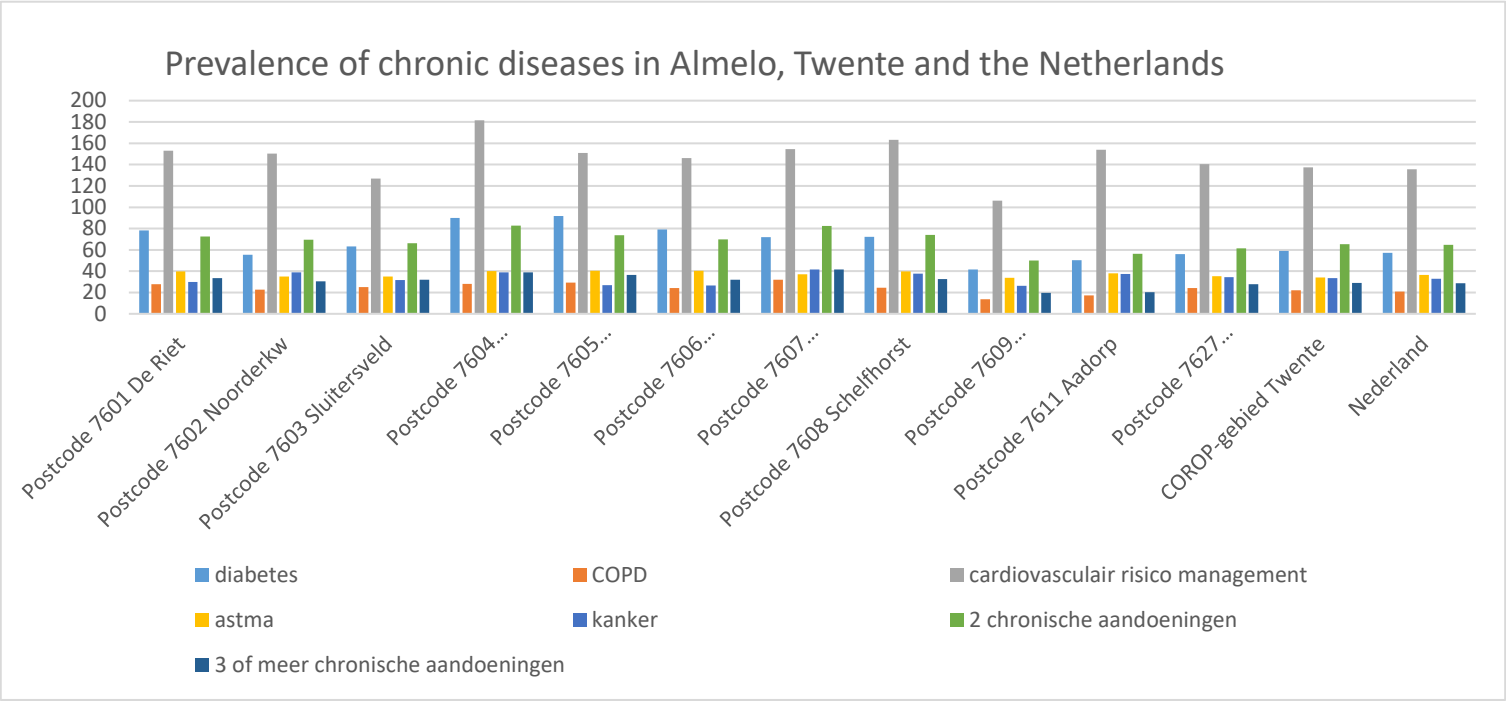

Figure 3: Prevalence of chronic conditions per 1.000 inhabitants in Almelo, Twente and the Netherlands (16)

The worse health status is also visible in the total healthcare cost per individual, which is about €125 higher per person in Almelo, coming in total to €2324 per person (32). For every discipline (physician, medical specialist, pharmaceutical, mental health) the use and costs of healthcare are higher in Almelo than in Twente (33).

Access to healthcare among lower socioeconomic individuals

Although basic health insurance is mandatory in the Netherlands, the variations in coverage caused by differences in income, education and health status, may affect access to healthcare (34). Other factors that influence access to healthcare for low income women are the barriers they face when using healthcare such as the attitude of the clinical staff, knowledge of available and needed care and costs (4). Preferences and attitudes of the patient and his family, cultural and linguistic differences, discrimination and differences in beliefs and attitudes about healthcare play an important role in access to and use of healthcare (34).

Several studies indicated that diagnosis and hospital admission occur at a later moment in the development of the disease for individuals of lower SES (35) (36) (37). This will result in higher healthcare costs, because individuals are severely ill at the moment of admission, will have a worse prognosis and will therefore need to stay longer in the hospital than when diagnosis and admission occur at an earlier point in disease development. Access to healthcare for lower SES individuals may be worse than their wealthier

counterparts, they use more primary healthcare than their wealthier counterparts (24) (5). Individuals with a lower SES visit their physician more often than individuals of higher SES, but visit less often a specialist and make less use of preventive healthcare services (24) (38). Furthermore, lower SES individuals use more prescribed drugs than higher SES individuals, but this is compensated by a lower use of non-prescribed drugs (38). However, as described in the above paragraph, lower SES individuals do have and experience worse health than higher SES individuals. When controlling for health status it appears that lower SES individuals make less use of healthcare than higher SES individuals (24) (5) (6).

Looking back at the situation in Almelo, some postal codes have a very low SES and report chronic diseases more often. Lifestyle factors influencing the development of the disease will play an important role in this. Next to this will a possibly lower health literacy among lower SES individuals play an important role in this. Health literacy is a constellation of skills which are necessary to understand, comprehend and function the health care system (39). Although the author of this thesis was not able to find direct evidence for the relation between lower SES and lower health literacy, it is known that lower health literacy is more common among individuals with a lower education, immigrants, older patients and ethnic minorities (39). Patients with lower health literacy were less likely to use preventive health care, diagnosis was more often delayed, they have more problems with understanding their medical condition and self-management skills and adherence to medical instructions is more difficult for them (39) (40).

Lower health literacy is more common among patients with a chronic disease as DM or hypertension (41) (42) (43), while good health literacy is important in order to well prosecute the self-management of these diseases within the disease management program. In the lower SES areas the lower health literacy, the worse lifestyle factors and the reduced access to care can influence the development of chronic diseases as DM and CVD and (self) management of this diseases. It is known that DM and CVD are more common among lower SES individuals than among higher SES individuals, since the lower SES individuals may also experience a reduced access to healthcare, it is not known how many of these individuals are still supervised by their GP. Lifestyle factors and self-management are important in managing these diseases. Since this is more difficult for lower SES individuals, help with and guiding of lifestyle factors and self-management by their GP is necessary. It is therefore of added value to know how many patients participate in the disease management program, and thus are supervised by their GP, and how many patients drop-out of the disease management program. Furthermore, the characteristics of the patients enrolled in the disease management programs are compared between higher and lower SES to determine if there is a difference in characteristics (age, BMI, age at onset). A possible difference between the higher and lower SES individuals on these characteristics will help to

better guide the supervision and interventions offered for those patients. When it, for example, appears that lower SES individuals have a significant higher BMI than higher SES individuals, additional (lifestyle) interventions can be incorporated into the guidelines. In order to make these (lifestyle) interventions succeed, taking into account the characteristics of the patient is important, i.e. for older patients a lower intensity or less stressful training (swimming, walking) will fit better than a high intensity training.

All these issues are addressed within the light of Almelo, since (very) low SES individuals and high SES individuals live together in this city. It will therefore be possible to make a suitable comparison between the higher and lower SES individuals.

In order to determine if there is a difference between the higher and lower SES individuals participating in the disease management programs and on what patient characteristics the lower and higher SES differ the following research questions will be answered:

- What is the incidence and prevalence of diabetes mellitus and cardiovascular diseases in the lowest and highest socioeconomic status postal code in Almelo?

- What is the rate of enrolment in the disease management programs for diabetes mellitus and cardiovascular risk management in the lowest socioeconomic status postal code in Almelo compared to the highest socioeconomic status postal code in Almelo? And, what is the drop-out rate of these disease management programs in the lowest and highest socioeconomic status postal codes in Almelo?

- What are the characteristics of the patients enrolled in the disease management programs for diabetes mellitus and cardiovascular risk management in the lowest socioeconomic status postal code in Almelo compared to the highest socioeconomic status postal code in Almelo? And what are the characteristics of the patients who dropped out of these disease management programs?

This research will contribute to the existing knowledge of SES and health and access to healthcare in that it is determined if lower SES individuals also experience the reduced access to healthcare in the disease management programs of DM and CVRM. Supervising and guiding the lower SES individuals within the disease management programs will be important for their health status and development of the disease. Knowing if lower SES individuals experience the reduced access also within the disease management program and on what characteristics there is a difference between higher and lower SES individuals will

help to steer the (lifestyle) interventions to better manage the disease. In societal perspective, better self-management of the disease will reduce the burden on healthcare, although this reduction will be limited. The reduction will primarily be in the lower use of medication and a smaller chance of getting complications because of a better lifestyle.

In the next chapter the situation on health and healthcare in Almelo will be further expanded. The disease management programs and the corresponding process will be highlighted in this chapter. At the same time the first research question on incidence and prevalence of DM and CVD will be answered in this chapter. In the chapter ‘Methods’ the dataset used for this study will be described and the methods for analysing this data will be described. In the chapter ‘Results’ the results of this analysis will be described which give an answer to the remaining two research questions. In the chapter ‘Discussion’ the results of this study will be compared to national and international literature and any further discrepancies will be tried to explain and verify. Eventually in the chapter ‘Conclusion’ the research questions will be answered and recommendations for practice and further research will be given.

Literature review

In this chapter first some underlying explanations for the socioeconomic health differences are given. After that more detailed information about the inclusion and exclusion criteria for the disease management programs is given in order to have a better insight in which factors are taken into account for inclusion in the program and for exclusion, i.e. are there criteria which discriminate (positively or negatively) on SES or on determinants of SES (e.g. educational level). Lastly, the incidence and prevalence of DM and CVD in the lower and higher SES postal codes of Almelo will be determined, giving answer to the first research question.

Explanations for socioeconomic health differences

An explanation for the socioeconomic health differences can be found in the concept of social class as a “fundamental cause” (44). In this concept it is argued that individuals of higher SES have better access to greater resources of knowledge, wealth, income and power and therefore are better able to take quick advantage of new health knowledge and technologies to improve their health (44). This will further increase the existing disparities between lower and higher SES individuals. That the inequity in healthcare is not only determined by income is apparent from several studies conducted in England, the United States and Canada, where inequities in healthcare among social classes remained despite the removal of economic barriers. (45) (46) (47) (48) (49). There are two mechanisms which can explain these persistent socioeconomic health differences between individuals. The first is that SES leads via intermediate factors to a worse health status. Intermediate factors can be risk factors which are more common among lower SES individuals, such as unhealthy lifestyle. The second mechanism is that worse health leads to negative effects on education and work and by that influences SES (24). An explanation for the worse experienced health is a reduced access to healthcare and lower or different use of healthcare (38). That individuals in lower income areas do not have equal access to healthcare is not only determined by the fact that they are disadvantaged individuals, but the characteristics of the disadvantaged neighbourhood also affect the ability to obtain healthcare (24) (7). The study of Kirby et al. stated that individuals in disadvantaged neighbourhoods were less likely to have visit a physician in the previous year (7) (50). Lower SES individuals make more use of ‘public’ services as emergency rooms and outpatient departments (51) and are more likely to be hospitalized for chronic medical conditions (52).

Inclusion and exclusion in the disease management programs for diabetes mellitus and cardiovascular risk management

All physician practices in Almelo offer the disease management programs for diabetes mellitus and CVRM (see table 1, Attachment 1). The disease management programs are offered in cooperation with chain partners, as physical therapists, dieticians and specialized nurses (53). To include patients in disease management programs there are several in- and exclusion criteria; disease specific criteria, general in- and exclusion criteria for participating in the disease management program and the physician has to be the primary provider and coordinator of healthcare (54). The latter criterion implies that the general practitioner has to be the primary treating physician, if a medical specialist takes over the treatment of the patient after referral, the participation in the disease management program stops. General in- and exclusion criteria for disease management programs are 1) patient is stabile with a low disease burden; 2) personal circumstances; 3) insufficient added value; 4) no show; 5) another disease management program. The decision to stop participation in the disease management program is a shared decision between physician and patient, aside from 'no show' when after repeated attempts it is not possible to come in contact with the patient. The physician then makes the decision to stop the disease management program on his one (54).

Diabetes mellitus

The disease specific in- and exclusion criteria for diabetes are that the patient has to be diagnosed with T90.2 diabetes mellitus type 2 according to the standards of the Nederlands Huisartsen Genootschap, NHG,(Dutch society for general practitioners), or patients diagnosed with another type of diabetes who are referred back to their GP. Diagnosis of diabetes is based on the blood glucose value of the patient after complaints or diseases which are the result of diabetes such as thirst, polyuria, emaciation and recurrent urinary tract infections. For persons older than 45 years old with a BMI >27, with diabetes mellitus type 2 in first line family members, with hypertension, with fat metabolism disorders, with (higher risk of) CVD and who are from a Turkish, Moroccan or Surinamese origin it is advised to determine the blood glucose value every three years. For persons of Hindu origin the same advice applies, but with an age limit of 35 years (55). Exclusion criteria for the disease management program diabetes are women diagnosed with diabetes who are pregnant or want to become pregnant, women with pregnancy diabetes, patients with diabetes which is in remission (54).

Cardiovascular risk management

Patients can participate in the disease management program for CVRM on primary prevention when they are diagnosed with K86 or K87 hypertension and use medication for this, T93 hypercholesterolemia and use medication for this or patients younger than 70 years

old with an increased 10 years risk of at least 10% on disease or death of CVD. Other patients who are suspected of increased vascular risk can be included in the disease management program if the risk profile gives rise to this. Individuals who have a higher risk of CVD are patients with DM and patients with rheumatoid arthritis (RA). For these patients setting up a risk profile for CVD is always offered. For patients who do not have one of the aforementioned diseases also a risk profile can be set up, for example when the patient has complaints, when there is a charge family history, smoking behaviour, obesity and (post) menopausal. A risk profile is always set up for patients who have a systolic blood pressure > 140 mmHg, who have a total cholesterol of >6,5mmol/l, smokers who are older than 50 years, when an individual uses antihypertensive agents or statin use, a first line family history of CVD before the age of 65 and chronic kidney damage (56). Exclusion criteria for the disease management program are an experienced event described in the secondary prevention of CVRM (54). For the disease management program of CVRM on secondary prevention there are no exclusion criteria. The inclusion criteria for participation in this disease management program are having experienced a K74 angina pectoris, K75 acute myocardial infarction, K76 other or chronical ischemic heart diseases, K89 cerebral ischemic or transient ischemic aortae (54). In attachment 1 a graphical representation of the inclusion procedure for the CVRM disease management program is present.

Incidence and prevalence of diabetes mellitus and cardiovascular diseases

The first research question to be answered is about the incidence and prevalence of DM and CVD. Answering this research question will give a better insight the quantity of the problem in lower SES areas compared to higher SES areas. Besides the most recent data about the incidence and prevalence of both DM and CVD also a forecast for the incidence and prevalence in 2020 is made.

Diabetes mellitus

DM is probably the most familiar chronic disease in the Netherlands, in 2015 the incidence was 60.500 in the Netherlands. In the same year the prevalence of DM was about 1.111.000 individuals in the Netherlands (57). In order to make a suitable comparison between the lower and higher SES postal codes in Almelo, Twente and the Netherlands in the figure below the prevalence is given per 1.000 patients.

In the higher SES postal code 7602 the prevalence of DM in 2014 was 55, 5 per 1.000 patients. In postal code 7609 the prevalence was 41, 5 per 1.000 patients in 2014. In postal code 7602 the prevalence of DM is expected to decrease by 2020, whereas in higher SES postal code 7609 the prevalence of DM is expected to increase by 2020. By 2020 both postal codes are expected to have a prevalence of diabetes around 50 per 1.000 patients.

In the lower SES postal codes the prevalence was 90, 0 per 1.000 patients in 7604 in 2014. By 2020 the prevalence in the lower SES postal code 7604 is estimated to be 85 per 1.000 patients. In postal code 7606 the prevalence of DM was 79, 0 per 1.000 patients in 2014. The estimation of the prevalence in postal code 7606 is 78 per 1.000 patients by 2020. It may be clear that the prevalence of DM differs a lot between the higher and lower SES postal codes in Almelo both for now and for the estimated prevalence by 2020. The prevalence of DM among the lower SES is much higher than the prevalence of DM among the higher SES individuals. There are no figures of the incidence of DM per postal code.

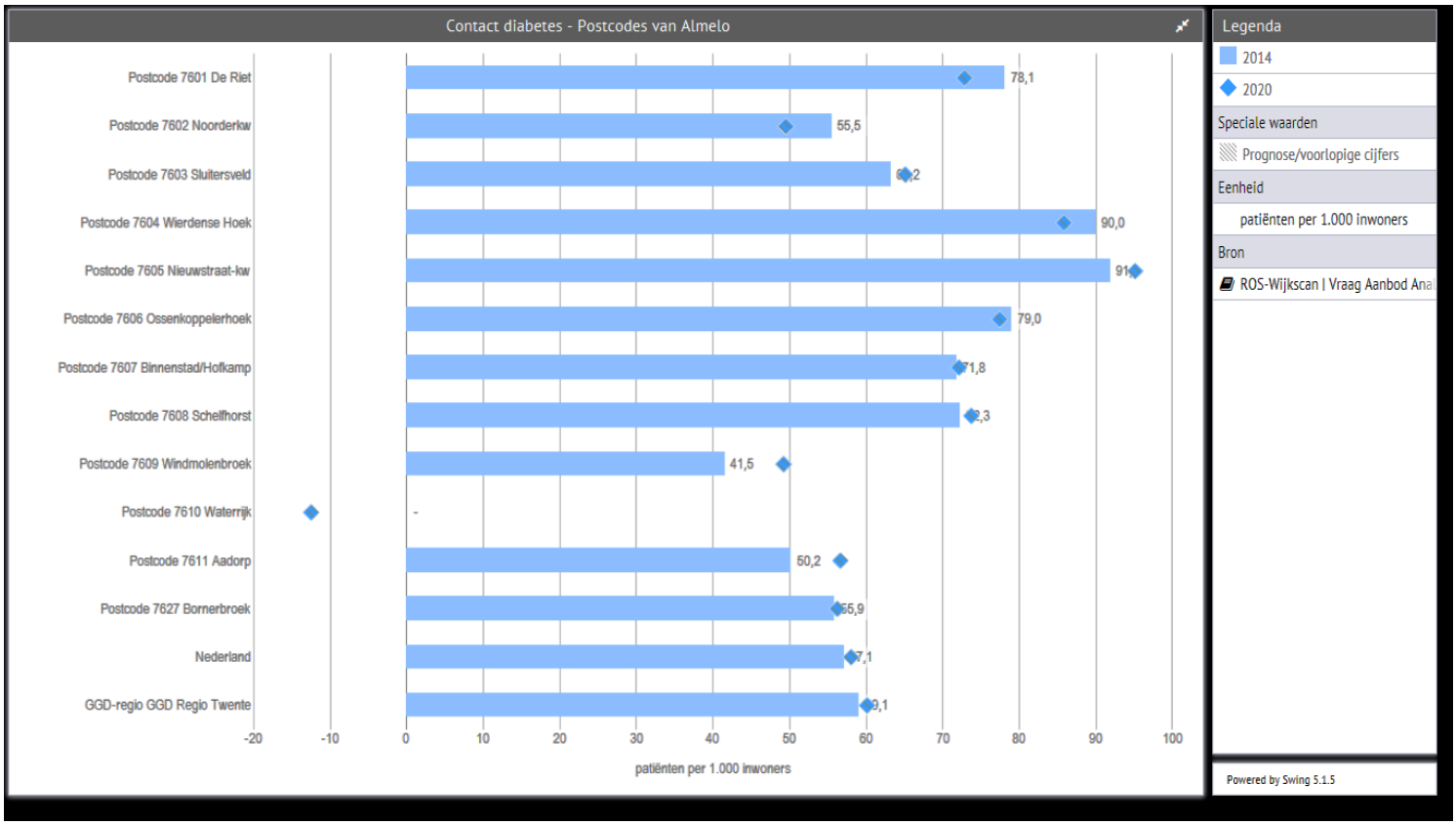

Figure 4:Prevalence of diabetes mellitus per postal code in Almelo, Twente and the Netherlands (69)

Cardiovascular diseases

In 2011 there were about 969.000 patients who were diagnosed with CVD and the incidence was 101.700 (58). In the higher SES postal code 7602 in Almelo the prevalence was 150,3 per 1.000 patients in 2014. The estimated prevalence of CVD is 150 per 1.000 patients by 2020. In postal code 7609 the prevalence of CVD was 106,2 per 1.000 patients in 2014. The estimated prevalence is 130 per 1.000 patients in 2020.

In the lower SES postal codes in Almelo the prevalence of CVD was 181,5 per 1.000 patients in 2014- postal code 7604. By 2020 the prevalence is estimated to be 180 per 1.000 patients. In the lower SES postal code 7606 the prevalence of CVD was 146,1 per 1.000 patients in 2014. The estimated prevalence of CVD is around 150 per 1.000 patients in 2020.

For the prevalence of CVD among higher and lower SES individuals the same trend is visible as for the prevalence of DM among higher and lower SES: among the lower SES individuals the prevalence of the chronic disease is higher than the prevalence among the higher SES individuals. Although the disparity between the prevalence among higher and lower SES individuals will be smaller by 2020, the lower SES individuals still will have a higher prevalence of CVD than higher SES individuals. For CVD there are also no figures about the incidence per postal code.

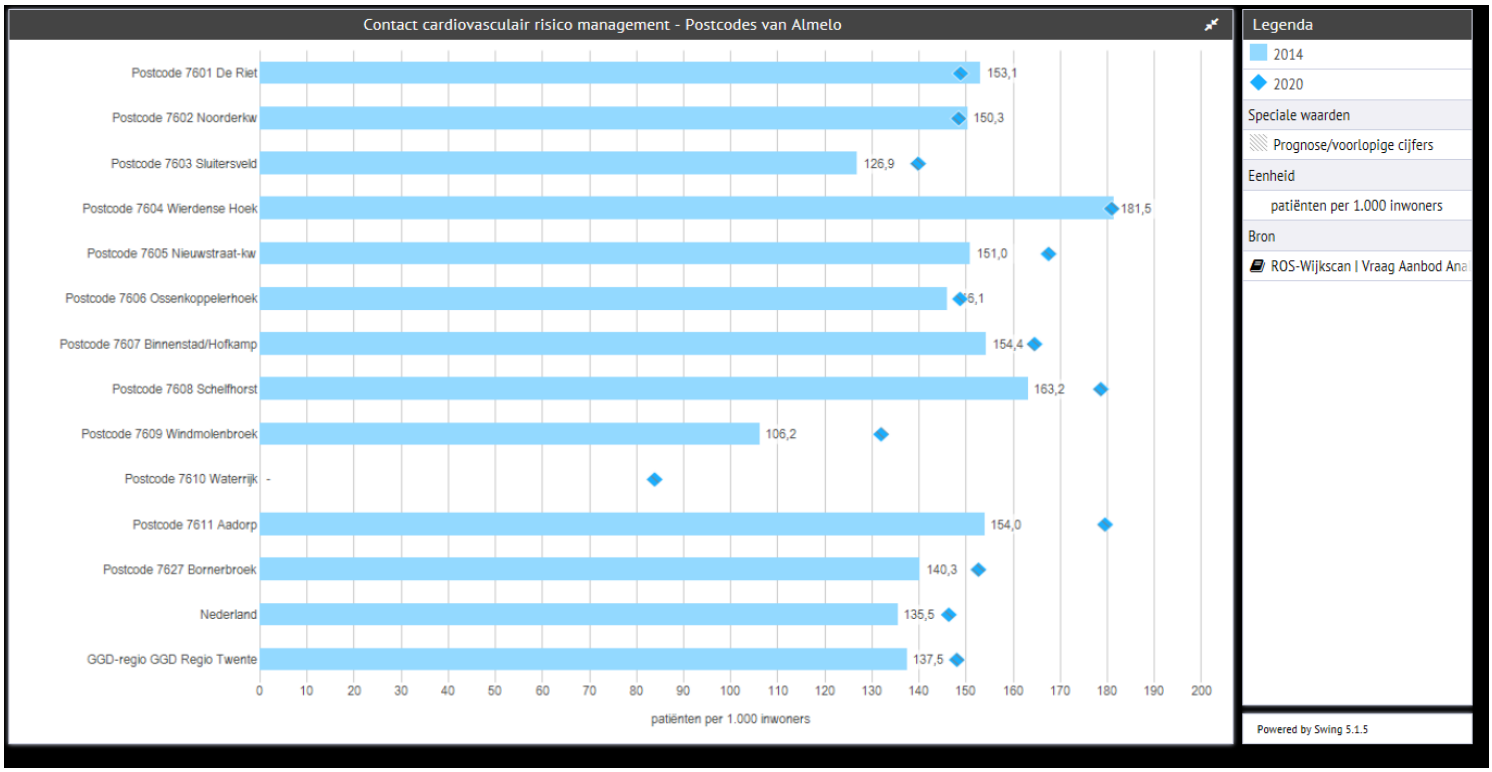

Figure 5: Prevalence of cardiovascular diseases in the postal codes of Almelo, Twente and the Netherlands (59)

In this chapter first some explanations of the socioeconomic health differences are given, as social class as fundamental cause and how SES and health status are related; first, SES can lead via intermediate factors to a worse health status and secondly, a worse health status can lead to negative effects on education and work which can lead to a lower SES. Secondly, the inclusion and exclusion criteria for the disease management programs are further highlighted. It appears that inclusion into the program is based on the diagnosis of the disease or in case of the increased vascular risk component of the CVRM program on the risk of getting a CVD. There are currently no criteria which account for a higher risk on CVD or DM for lower SES individuals. Lastly, the incidence and prevalence of DM and CVD are

determined. It is shown that the prevalence of both DM and CVD is higher among lower SES individuals. The prevalence of DM among the lower SES postal was 90,0 per 1.000 patients and 79,0, whereas for the higher SES postal codes this is 55,5 per 1.000 patients and 41,5. The prevalence of CVD among the lower SES postal codes was 181,5 per 1.000 patients and 146,1 , whereas among higher SES individuals the prevalence was 150,3 per 1.000 patients and 106,2. For the incidence of DM and CVD only national data could be found, there were no data found of the incidence in lower and higher SES postal codes in Almelo.

In the next chapter the methods of this study are discussed, the design of this study, the dataset used, the participants, the procedure and the way of analysing the data is described. After that the possible differences between higher and lower SES individuals will be further explored in the results section, which will give an answer to the two remaining research questions.

Methods

This study is a quantitative cross-sectional research in which the enrolment and drop-out rate and patient characteristics of the patients enrolled and the patients dropped out are compared between higher SES individuals and lower SES individuals. The lower SES areas in Almelo concern the postal codes 7604 “Wierdense Hoek” and 7606 “Ossenkoppelerhoek”. The higher SES area in Almelo concerns postal codes 7602 “Noorderkwadraat” and 7609 “Windmolenbroek”. According to ‘Centraal Bureau voor de Statistiek’ (CBS) there are 5295 individuals that reside in postal code 7602 in 2016. The population in postal code 7609 was 13925 in 2016. For postal code 7604 this was 6665 and for postal code 7606 this is 7205 in 2016 (60).

Study design

This study is retrospective, data collected for purpose of the disease management program in the health information system of the GP practices in postal codes 7602, 7604,7606 and 7609 is used. The GP practices in Almelo are cooperated with ‘Federatie Eerstelijnszorg Almelo en omgeving’ (FEA). FEA collects the data out of the health information systems of their GPs half- yearly in order to make a good understanding of the quality of care and the collaboration between chain partners. Data from the GP practices in postal codes 7602, 7604, 7606 and 7609 was extracted from this database of FEA. This is the most recent data (December 2016) of the patients participating in the DM disease management program and of the patients participating in the CVRM disease management program. Patients who drop-out before January 2016 are not in this data.

Participants

In this study data of patients already diagnosed with DM or CVD or individuals who have an increased vascular risk is used. Data from patients who were younger than 18 years or older than 70 years were excluded, since the influence of socioeconomic factors may become less pronounced as genetic and biologic factors are more pronounced. Therefore the “middle-old” individuals (70 to 79) and the “old-old” individuals (older than 80) are excluded (61). As well men as women are included in the study. Race and ethnicity are no reason to exclude individuals from this study, as is educational attainment no reason for exclusion. Only data from patients registered with a GP practice in the postal codes 7602, 7604, 7606 or 7609 is included, all other postal codes are excluded from this study.

Data

The data in this study are the most recent (December 2016) data of the disease management programs for DM and CVRM. There were two datasets in this study. The first dataset consists of patient characteristics as BMI, age, sex, date of admission to the disease management program, number of appointments, date of exclusion from the disease management program, reason for exclusion and in which GP practice the patient is registered. The second part of the dataset consists of NHG-indicators (the Dutch general practitioners society). This data is collected for purpose of the InEen (organisation dedicated to strong first line care) 'benchmark disease management programs' yearly. The data collected by FEA was studied in this research, since the report on this benchmark was not yet published at the start of this research. Prior reports on the benchmark disease management programs can be find at the website of InEen (62). This dataset consists of absolute numbers and percentages on the total population in the GP practice, the population diagnosed with CVD and how many of them are treated in the first line, and how many in the second line.

For the indicator 'blood pressure' absolute numbers and percentages are present on how many patients blood pressure was measured in the last 12 months, in how many patients aged younger than 70 this was done and how many patients who had a blood glucose level <140 mmg Hg.

For the indicator 'LDL and lipid lowering drugs' absolute numbers and percentages are present on patients familiar with CVD who do not use LDL and lipid lowering drugs in the last 5 years, patients familiar with CVD who do not use LDL and lipid lowering drugs but do have had a LDL measurement in the last 5 years, patients familiar with CVD who do use LDL and lipid lowering drugs in the last 12 months, patients familiar with CVD who do use LDL and lipid lowering drugs and do have had a LDL measurement in the last 12 months, number of patients familiar with CVD who have had a LDL measurement (last measurement ever) and who are younger than 80 years, patients familiar with CVD who have had a LDL measurement in the last 5 years which was ≤ 2,5 mmol and who are younger than 80 years, patients familiar with CVD from whom the smoking behaviour is current and familiar and the number of patients familiar with CVD who smoke within the group of patients from whom the smoking behaviour is current and familiar.

For the indicator 'Nutrition, movement and BMI' the absolute number and percentages are present on the patients familiar with CVD from whom BMI was measured in the last 12 months, patients familiar with CVD aged younger than 70 years from whom BMI was measured in the last 12 months, number of patients familiar with CVD aged younger than 70 years from whom BMI was < 25 kg/m^2 in the last 12 months, number of patients familiar with CVD from whom movement was checked in the last 12 months, number of

patients familiar with CVD with whom nutrition is discussed in the last 12 months, number of patients familiar with CVD from whom alcohol use is registered in the last 5 years.

For the indicator 'Kidney function' the absolute numbers and percentages are present on the patients familiar with CVD from whom eGFR is registered in the last 5 years, patients familiar with CVD aged younger than 65 years with an eGFR ≤ 60ml/min/1,73m^2 or patients aged older than 65 years with an eGFR< 45ml/min/1,73m^2, patients familiar with CVD in the group of patients aged younger than 65 years with eGFR ≤ 60ml/min/1,73m^2 or patients aged older than 65 years with an eGFR< 45ml/min/1,73m^2, patients familiar with CVD with an episode of kidney failure in the group of patients aged younger than 65 years with eGFR ≤ 60ml/min/1,73m^2 or patients aged older than 65 years with an eGFR< 45ml/min/1,73m^2, number of patients with contra-indication 'reduced kidney functioning' in the group of patients with an episode of kidney failure.

For the 'other' indicators absolute numbers and percentages are present on number of patients familiar with CVD who are prescribed with anticoagulants or platelet aggregation inhibitors, patients with a sober glucose measurement in the last 5 years, patients familiar with CVD who are vaccinated with influenza in the last 12 months, patients familiar with CVD with a complete risk profile (smoking behaviour, nutrition, movement, alcohol use, BMI, blood pressure, glucose level, LDL).

The same indicators are used for the increased vascular risk component of the CVRM disease management program. In the measures of these indicators 'CVD' is then replaced by 'hypertension or hypercholesterolemia'.

In the dataset for DM the same indicators are used, however, also the HbA1c levels, smoking behaviour and feet and eye research are registered. For the indicator 'HbA1c level' the absolute numbers and percentages are present on patients with DMII from whom the HbA1c level is registered in the last 12 months, number of patients with DMII younger than 70 years who have had a HbA1c level measurement in the last 12 months, number of patients younger than 70 years who have had a HbA1c level measurement with an outcome ≤ 53 mmol/mol in the last 12 months, number of patients who have had a HbA1c level measurement with an outcome > 64 mmol/mol in the last 12 months.

For the indicator 'feet research' the absolute numbers and percentages are present on the patients with DMII who have had a feet research in the last 12 months, patients with DMII who have had feet research with a Simm's classification in the last 12 months, patients with DMII who have a diabetic foot deviation.

For the indicator 'eye research' absolute numbers and percentages are present on number of patients with DMII with a fundus control in the last 24 months and the number of patients with DMII with diabetic retinopathy.

For the indicator 'treatment' absolute numbers and percentages are present on

patients with DMII who are treated only non-medicament, patients with DMII treated only with oral glucose lowering medication, patients with DMII treated with oral glucose lowering medication and insulin, patients with DMII only treated with insulin, patients with DMII who are vaccinated with influenza in the last 12 months.

For the indicator 'total control policy' the number of patients with DMII who have a combination of data on the before mentioned indicators (HbA1c, blood pressure, kidney function, smoking behaviour, BMI, feet and eye research, nutrition, movement and alcohol use).

The total sample size of this study were only the individuals classified as "young" are included is 3093 persons; 1279 individuals who are participating in the disease management program for DM, 1814 individuals who are participating in the disease management program for CVRM from whom 1288 individuals are participating in this program because of an increased vascular risk and 526 individuals are participating because of CVD.

Procedure

The data for this study is extracted from the database of the 'Federatie Eerstelijnszorg Almelo en omgeving' (FEA). They collect data from the health information systems of their cooperative general practitioners yearly. Data from the general practitioners in the postal codes 7602, 7604, 7606 and 7609 is extracted from the database. In table 1, for higher SES postal codes, and in table 2 for lower SES, the postal code location of the GP practices and the disease management programs they do not offer is given. The data is anonymised by a staff member quality and safety from FEA before it was sent to the researcher. Firstly, the age of patients was identified as "young" for individuals who are younger than 69 years old, individuals who are aged 70 to 79 are classified as "middle-old" and individuals who are older than 80 are classified as "old-old". The data of all individuals who are classified as "middle-old" or "old-old" are removed from the dataset. Secondly, the data was split into one dataset for the lower SES areas (7604 and 7606) and one dataset for the higher SES areas (7602 and 7609). To calculate the most truthful enrolment and drop-out rates individuals need to participate in the disease management program for longer than 7 days, since there were many individuals in the dataset who were enrolled and dropped out of the program on the same day or within a couple of days.

Table 1: General practitioners practices in higher socioeconomic postal codes

GP practice	**A**	**E**	**F**	**G**	**H**	**I**
Located in postal code	7602	7602	7609	7609	7609	7609
Does not offer disease management program		CVRM				

Table 2: General practitioners practices in lower socioeconomic postal codes

GP practice	**B**	**C**	**D**	**J**	**K**	**L**	**M**
Located in postal code	7606	7606	7606	7604	7604	7604	7604

Analysis

The data was analysed with IBM SPSS Statistics version 24 (SPSS Inc., Chicago, USA) and Microsoft Office Excel 2013. The data from the lower SES postal codes is compared to the data from the higher SES postal codes on incidence and prevalence, enrolment and drop-out and patient characteristics with descriptive statistics of determinants age, sex and BMI.

To calculate the rate of enrolment for a disease management program it is researched if individuals have dropped out of the program and on what date (at least 7 days enrolled in disease management program). The persons who are not dropped out of the program are still participating in the program and therefore measured in the enrolment rate. It is then determined in which year they are enrolled to the program. The total number of individuals who are still enrolled in the disease management program is divided by the total number of individuals (both enrolled and dropped-out). This is done for all the GP practices together, but also for all GP practice separately. For individuals who have dropped out of the program it is determined on which date they have dropped out of the program, reasons for dropping out of the program is not mentioned in the data. For the individuals who dropped out also the date of inclusion in the disease management program is determined. All patients who dropped out of the program dropped out in 2016, there is no data about the individuals who dropped out earlier, since this is not included in the report period. The drop-out rate in total and per GP practice is calculated in the same way as the enrolment rate is.

The patient characteristics are determined with the descriptive statistics functions in SPSS. The descriptive statistic function and the explore function in SPSS are used to determine the patient characteristics on the determinants age, sex, BMI, number of appointments, data of inclusion and date of exclusion.

The Mann-Whitney U test was used for the comparison between independent variables of SES (high/low), enrolment (yes/no), age at onset, age and BMI. The non-parametric test was used to determine if there was a difference between the higher and lower SES individuals. The Mann- Whitney U test makes it possible to compare means of the samples (high SES/ low SES) that are withdrawn from the same population (Almelo). As level of significance $p<0,05$ was used. The null hypothesis was that there is no difference between the lower and higher SES individuals.

Results

In this chapter the research questions on the rate of enrolment and drop-out rate between higher and lower SES postal code areas and the possible differences in patient characteristics will be answered. The research questions will be answered per disease management program.

Enrolment and drop-out

In this research, we wanted to explore if there is a difference in rate of enrolment in the DMPs and drop-out rate between the higher and lower SES individuals. If there is a difference and how large this difference is will be topic of the upcoming section. Firstly, the enrolment and drop-out rate for the disease management program DM will be determined. After that, the enrolment and drop-out rate for the disease management program CVRM will be determined for the CVD component of the program and for the increased vascular risk component. It is hypothesized that the lower SES individuals might have a slightly higher drop-out rate than the higher SES individuals.

Disease management program for diabetes mellitus

The study sample of the DM disease management program consists of 1278 individuals, of whom 482 are registered with a GP in the higher SES postal codes and 796 individuals are registered with a GP in the lower SES postal codes.

Table 3: General characteristics of the study sample for diabetes mellitus

	High socioeconomic status ***n= 482***	**Low socioeconomic status** ***n= 796***
Age (M ± SD)	58,56 ± 8,00	58,28 ± 8,55
(min. – max.)	25 – 69	21 – 69
Age at onset (M ± SD)	53,17 ± 8,05	52,57 ± 12,37
Sex (n [%])		
Women	212 (44,0)	370 (46,5)
Men	270 (56,0)	426 (53,5)
BMI (M ± SD)	30,85 ± 5,66	31,94 ± 5,91
(min. - max.)	17,20 – 50,20	19,00 – 54,2

In table 3 below the rate of enrolment and the drop-out rate are given for the higher SES individuals and for the lower SES individuals. It appears that the rate of enrolment is higher among lower SES individuals and the drop-out rate is lower. The rate of enrolment among the lower SES individuals is 99%, among the higher SES individuals this is 94%. It therefore seems that more lower SES individuals are enrolled in the program and that they less often

drop-out of the program. The absolute numbers in the table, however, show that there are very few drop-outs which make it hard to draw conclusions upon these numbers.

Table 4: Rate of enrolment and drop-out rate of the DM disease management program in the lower and higher SES individuals

SES	Enrolment	Drop-out
Lower SES % (ABS)	99% (71)	1% (1)
Higher SES % (ABS)	94% (53)	6% (3)
Average % (ABS)	97% (121)	3% (4)

Looking at relation of drop-out of the program and the SES of individuals it appears that there is no significant relation between dropping out of the program and whether these individuals have a higher or lower SES. A Mann-Whitney U test was performed to determine if there was a difference. The test reveals a p-value that is larger than 0,05, the critical value of significance that is used in this study, which indicates that there is no significant relation between dropping out of the disease management program and the SES of individuals.

Table 5: Mann-Whitney U test for relation between SES and drop-out in DM disease management program

Ranks

	SES	N	Mean rank	Sum of ranks
Excluded in report period	High	398	635,22	195648,00
	Low	971	641,52	622912,00
	Total	1279		

Test statistics

	Excluded in report period
Mann- Whitney U	148062,000
Wilcoxon W	195648,000
Z	-0,636
Asymp. Sig. (2 tailed)	0,524

The general reasons for drop-out of the disease management program are a stabile low disease burden (there is no cut-off value, but a decision taken by GP and physician), personal circumstances, not enough added value, no show or the patient is participating in another disease management program. Supposing that the reasons for drop-out are equally distributed among the disease management program, a lower drop-out rate of the DM disease management program can be caused by the latter reason- the patient is participating in another disease management program. Patients who participate in the CVRM disease

management program and who develop DM will be excluded from the CVRM disease management program and included in the DM disease management program. This is in turn not the case for patients who participate in the DM disease management program.

Disease management program for cardiovascular risk management

The rate of enrolment and drop-out rate calculated for the CVRM disease management program is described in this section. The two components of the CVRM disease management program will be discussed separately, starting with the CVD component.

Cardiovascular diseases

The general characteristics of the study sample of the CVD component of the CVRM disease management program are presented in table 5 below. There are 526 individuals included in this program, of which 223 have high SES and 303 have low SES.

Table 6: General characteristics of the study sample of cardiovascular diseases

	High socioeconomic status ***n= 223***	**Low socioeconomic status** ***n= 303***
Age (M ± SD)	59,61 ± 6,14	58,70 ± 7,12
(min. – max.)	43 - 69	33 - 69
Age at onset (M ± SD)	58,70 ± 10,76	56,55 ± 12,51
Sex (n [%])		
Women	36,8% (82)	40,6% (123)
Men	63,2% (141)	59,4% (180)
BMI (M ± SD)	28,05 ± 4,80	28,08 ± 4,87
(min. - max.)	18,00 – 42,57	14,24 – 47,32

The enrolment rate and drop-out rate among the higher and lower SES individuals of the CVD component of the CVRM disease management program are shown below. The drop-out rate among the lower SES individuals is higher than among the higher SES individuals, though also here the absolute numbers on drop-out are small which make it hard to draw conclusions upon.

Table 7: Enrolment and drop-out rate for CVD disease management program among higher and lower SES individuals

SES	**Enrolment**	**Drop-out**
Lower SES % (ABS)	91% (72)	9% (7)
Higher SES % (ABS)	94% (67)	6% (4)
Average % (ABS)	93% (139)	7% (11)

Within the CVD component of the CVRM disease management program there also seems to be no significant relation between drop-out and the SES of individuals. The p-value is much higher than the critical significance rate of 0,05 so there is no significant relation between drop-out of the CVD component and SES.

Table 8: Mann-Whitney U test for the relation between SES and drop-out in CVD disease management program

Ranks

Excluded in report period	SES	N	Mean rank	Sum of rank
	High	214	252,43	54020,00
	Low	297	258,57	76796,00
	Total	511		

Test statistics

	Excluded in report period
Mann-Whitney U	31015,000
Wilcoxon W	54020,000
Z	-0,761
Asymp. Sig. (2-tailed)	0,447

Increased vascular risk

In the table below the general characteristics of the study sample are given. The total study for increased vascular risk concerns 1288 individuals, 439 of them are higher SES individuals and 849 are lower SES individuals.

Table 9: Characteristics of the study sample

	High socioeconomic status *n*= 439	**Low socioeconomic status *n*= 849**
Age (M ± SD)	61,07 ± 6,30	59,35 ± 7,23
(min. – max.)	41 - 69	18 – 69
Age at onset (M ± SD)	60,65 ± 6,06	58,17 ± 7,25
Sex (n [%])		
Women	180 (41,0)	444 (52,3)
Men	259 (59,0)	405 (47,7)
BMI (M ± SD)	28,47 ± 4,49	29,82 ± 5,70
(min. - max.)	18,80 – 44,70	16,70 – 58,50

The enrolment rate of the increased vascular risk component is lower among the lower SES individuals than among the higher SES individuals, as was the case in the enrolment and drop-out rate at the CVD component of this disease management program. Noticeable is the higher number of absolute drop-outs among the lower SES individuals compared to the higher SES individuals.

Table 10: Rate of enrolment and drop-out rate for increased vascular risk among higher and lower SES individuals

SES	Enrolment	Drop-out
Lower SES % (ABS)	93% (189)	7% (15)
Higher SES % (ABS)	96% (105)	4% (4)
Average % (ABS)	87% (272)	6% (17)

Besides that the absolute drop-out among the lower SES is in this case higher than the drop-out among higher SES individuals, still the Mann Whitney U test does not indicate a significant relation between the drop-outs and the SES of these individuals.

Table 11: Mann-Whitney U test for the relation between SES and drop-out in increased vascular risk disease management program

Ranks

	SES	N	Mean rank	Sum of ranks
Excluded in report period	High	428	631,48	270273,00
	Low	835	632,27	527943,00
	Total	1263		

Test statistics

	Excluded in report period
Mann- Whitney U	178467,000
Wilcoxon W	270273,000
Z	-0,059
Asymp. Sig. (2-tailed)	0,953

The comparisons made between the higher and lower SES areas and their enrolment and drop-out rate show that there are no large differences among this. The research question stated was 'What is the rate of enrolment in the disease management programs for DM and CVRM in the lowest SES status postal code in Almelo compared to the highest SES status postal code in Almelo? And, what is the drop-out rate of these disease management programs in the lowest and highest socioeconomic status postal codes in Almelo?'

In the CVRM disease management program the enrolment is higher among the higher SES individuals (CVD: 94% resp. 91% and increased vascular risk 96% resp. 93%), whereas in the DM disease management program the enrolment is higher among the lower SES individuals (99% resp. 94%). The drop-out rate among the higher SES individuals is lower in the CVRM disease management program, in the increased vascular risk component the drop-out among lower SES individuals is 7%, whereas among higher SES individuals this

is 4%. In the CVD component of the program the drop-out rate among the lower SES individuals is 9%, whereas among the higher SES this is 6%. For the DM disease management program this is the other way around, among the higher SES individuals the drop-out is higher than among the lower SES individuals (resp. 6% and 1%). The Mann-Whitney U test executed to determine if there is a significant relation between the higher and lower SES individuals on drop-out underpins the before mentioned comparisons, there is no significant relation found between SES and the drop-out, in none of the disease management programs.

Patient characteristics

In this section the last research question on patient characteristics of the patients enrolled in the DMPs and the possible differences between these characteristics among higher and lower SES individuals is answered. Within this research question more disparities between the higher and lower SES individuals are expected. The lower SES individuals will be younger at diagnosis of the chronic disease than their wealthier counterparts, because of the worse lifestyle factors, more unhealthy behaviours and the descriptions in literature on the inverse relation between SES and DM and between SES and hypertension. Because of the worse lifestyle factors and more unhealthy behaviours the lower SES individuals will probably have a higher BMI than the higher SES individuals.

Disease management program for diabetes mellitus

The patient characteristics of the higher and lower SES individuals enrolled in the disease management program does not show large differences in age at the onset and age, as is shown in table 12. The patient characteristics BMI, however, does show quite a large difference between the higher SES individuals and the lower SES individuals (resp. 30,85 and 31,94). After performing the Mann-Whitney U test it appeared that the patient characteristics age and age at the onset do have a p-value which is higher than 0,05. The relationship between SES and BMI is significant, which can be concluded from the p-value of ,000. That BMI is a significant patient characteristic in relation to the SES of individuals is quite in line with the expectations, when looking at the important influence from lifestyle factors in developing DM. Comparing the mean BMI of the individuals enrolled in the DM disease management program to the mean BMI of the individuals enrolled in the CVRM disease management program shows that the mean BMI of the individuals in the DM program is higher.

Table 12: Patient characteristics of patients enrolled in DM disease management program among higher and lower SES

	Higher SES	Lower SES	P-value
Age at the onset (M ± SD)	58,56 ± 8,00	58,28 ± 8,55	0,760
Age (M ± SD)	53,17 ± 8,05	52,57 ± 12,37	0,417
BMI (M ± SD)	30,85 ± 5,66	31,94 ± 5,91	0,000

Disease management program for cardiovascular risk management

Cardiovascular diseases

In the CVD component of the CVRM disease management program the patient characteristics of the higher SES are not that different from the characteristics of the lower SES individuals. Only on the characteristic age at onset of the disease there is a difference between the higher and lower SES individuals. The lower SES individuals are younger when they start with the disease management program than the higher SES individuals. The p-value of the relation between the age of onset and SES is lower than 0,05 and this relation between age of onset and SES is therefore significant.

Table 13: patient characteristics of the patients enrolled in the CVD disease management program among higher and lower SES

	Higher SES	Lower SES	P-value
Age at the onset (M ± SD)	58,70 ± 10,76	56,55 ± 12,51	0,014
Age (M ± SD)	59,61 ± 6,14	58,70 ± 7,12	0,182
BMI (M ± SD)	28,05 ± 4,80	28,08 ± 4,87	0,652

To be included in the CVD component of the CVRM disease management program the patient needs to have experienced an event, i.e. a TIA. Inclusion in this component of the program is therefore nearby the date when the event took place. The mean age difference between the higher and lower SES areas says therefore also something about the age when individuals first experienced an event. The lower SES individuals are younger when they are included in the program and will therefore also be younger when they experience their first event. This can be caused by worse lifestyle factors, since lower SES individuals are also younger when they are enrolled in the increased vascular risk component of the CVRM disease management program, see table 13 in the next paragraph.

Increased vascular risk

Within the increased vascular risk part of the CVRM disease management program patients are enrolled when they are diagnosed with hypertension or hypercholesterolemia or for patients who are at higher risk of CVD. In the introduction it is described that low SES is related to both the incidence and prevalence of hypertension. Looking at the patient characteristics presented in table 13 below it may be clear that there is a significant relation between all the patient characteristics took into account here and SES. The mean BMI is higher for lower SES individuals than for higher SES individuals, the mean age and the mean age at onset are lower for the lower SES individuals than for the higher SES individuals. Within the dataset is not clear whether individuals are enrolled in the program because they are diagnosed with hypertension or hypercholesterolemia or because they are at higher risk of CVD.

Table 14: patient characteristics of the patients enrolled in the increased vascular risk component in the CVRM disease management program among higher and lower SES.

	Higher SES	**Lower SES**	**P-value**
Age at the onset (M ± SD)	60,65 ± 6,06	58,17 ± 7,25	0,000
Age (M ± SD)	61,07 ± 6,30	59,35 ± 7,23	0,000
BMI (M ± SD)	28,47 ± 4,49	29,82 ± 5,70	0,000

In this section the last research questions was to be answered, ‘What are the characteristics of the patients enrolled in the disease management programs for DM and CVRM in the lowest SES postal code in Almelo compared to the highest SES status postal code in Almelo? In all DMPs there is a difference determined between the higher and lower SES individuals enrolled. This is in line with the expectations of this study in which a difference between the higher and lower SES individuals was hypothesized in disadvantage of the lower SES individuals. In the DM disease management program a significant relationship between BMI and lower SES was determined; lower SES individuals have a significantly higher BMI than higher SES individuals. On the characteristics ‘age’ and ‘age at onset’ no significant relation was found. Within the CVRM disease management program there is a significant relationship determined between the age at onset and the lower SES individuals; the lower SES individuals are significantly younger when they are included in the program than higher SES individuals. In the increased vascular risk component of the disease management program relationships between all the patient characteristics took into account and the lower SES were found; lower SES individuals were significantly younger when included in the program, are in general also younger than higher SES individuals and have a significantly higher BMI than higher SES individuals

Discussion

In this chapter a short summary on the research questions and their outcomes will be given. Secondly, the results and whether they fit with the hypothesis are discussed and explanations based on the national and international literature will be given. Alongside these points also the strengths and weaknesses of this study will be addressed and finally, some recommendations for practice and further research will be given.

This study was intended to research if there is a difference in health status between the lower SES individuals included in the disease management program for DM or CVRM and the higher SES individuals included in the disease management program for DM or CVRM. To research this the situation in Almelo was investigated since there are some postal codes which have a (very) low SES and there are some postal codes which have a high SES.

First the incidence and prevalence among the higher SES individuals and among the lower SES individuals were measured. There were no figures about the incidence of DM and CVD per postal code in Almelo. The prevalence among the lower SES individuals was found to be higher for both DM and CVD. A higher prevalence of these diseases among lower SES individuals was also expected based on the literature that there is an inverse relation between SES and DM and between SES and hypertension and worse lifestyle factors among lower SES individual (31) (30). In a study conducted in the 1990s in eight European countries it was determined that most diseases showed a higher prevalence among lower SES individuals (62). Chaturvedi et al. found in the Whitehall cohort study and in the London cohort study a mortality rate that was twice as high in individuals of lower SES with diabetes as in the highest SES groups (63).

Secondly, the rate of enrolment and drop-out rate of the DMPs was calculated among the higher SES individuals and among the lower SES individuals. There were no significant differences in enrolment and drop-out between those two groups. In the DM disease management program the rate of enrolment was higher among the lower SES individuals while in the CVRM disease management program the rate of enrolment was higher among the higher SES individuals, although there were no significant differences in the enrolment between the two groups in both disease management programs. The higher enrolment rate in the DM disease management program among lower SES can be caused by the less optimal self-management and the worse lifestyle, since it is possible for patients with DMII to no longer use medication when lifestyle is optimal. To reach this, well-developed knowledge about blood glucose levels and the factors influencing this in one's specific situation is necessary. For lower SES individuals it can be harder to develop this knowledge and bring it into practice. Furthermore, lifestyle factors are very important in the development of DMII,

however, lifestyle factors play also an important role on development of CVD, although in CVD there is also a prominent role for heredity (65). That there is no significant relation between SES and drop-out differs slightly from the hypothesis. It was expected by the author that the lower SES individuals would have had a slightly higher drop-out rate of the programs than the higher SES individuals, because of the lower health literacy and the later diagnosis of the disease (39) (40) .The health status of the lower SES individuals could therefore be worse leading to drop-out of the program by referral to a specialist. This does not have to be a worse-case scenario, as is might sound, because the patient is still under treatment for his/her disease, but it appeared that self-management and regular appointments with their GP is not enough to well manage the disease.

Thirdly, the patient characteristics of the patients enrolled in the DM disease management program and the CVRM disease management program were compared between the higher and lower SES individuals. Within the DM disease management program a significant relation between BMI and SES was measured. The RIVM even predicted in their 2009 report on diabetes that the highest increase in incidence of diabetes is dedicated to obesity. A maximum of 55% of the increase in patients with diabetes can be attributed to the increase in the number of patients with obesity (64). Prevention and treatment of obesity, inactivity and other lifestyle factors can possibly help to reduce the incidence of diabetes in the upcoming years. Janssen, Boyce and Simpson describe in their research that lower SES is a risk factor for obesity, both lower SES on individual level and lower SES on area level are inversely related to obesity (65). Obesity is related to a higher risk of DM and to higher risk on CVD (67) (68) (69). Individuals with a low-risk lifestyle (not smoking, engaged in regular physical activity, consuming healthful diet, moderate use of alcohol and optimal body weight) have a significantly lower risk of DM (70). Each low-risk lifestyle factor is associated with a 31% - 39% (resp. men and women) lower risk of DM (70). The risk of developing DM by obesity will be higher than the risk of developing CVD by obesity, since lifestyle factors play a greater role in developing DM than in developing CVD, in which heredity also plays an important role.

Within the CVRM disease management program the age of onset was earlier for the lower SES individuals in the CVD program. Within the CVRM disease management program on increased vascular risk in all patient characteristics a significant relation with SES was found. As discussed in the introduction of this thesis, lower SES individuals have worse health behaviours and are therefore more likely to develop chronic diseases. Furthermore, it is known that there is an inverse relation between SES and hypertension (31) (30). The results in this study underpins that. Based on the literature describing that lower SES is related to both incidence and prevalence of hypertension, that lower SES individuals are less likely to use preventive healthcare and the young age of onset in the CVD component of the

program it is plausible that the lower SES individuals are enrolled because they are diagnosed with hypertension. The significant relations between the patient characteristics in the increased vascular risk program and SES can be explained by the higher incidence and prevalence of hypertension among lower SES individuals (and an inclusion criteria for the disease management program is being diagnosed with hypertension), or a higher score on the risk profile which lead to inclusion in the program. Within 4 decades of study a consistent inverse relation between CVD and SES indicators was determined (66). This inverse relation between CVD and SES was also found in this study, based on the age at onset of the disease.

Limitations of the study

This study was conducted with data obtained from FEA, since these data was collected by the GPs and FEA themselves a medical ethical review was not necessary to obtain, which in light of privacy issues and efficiency was an advantage. Because the data was gathered in this way it was also possible to use all the data available on disease management programs in the corresponding postal codes. On the other hand, the data that was available for this study was also a limitation in this research. It appeared that it was not possible with this dataset to determine if lower SES individuals experience a reduced access to care, which was originally the goal of the research. With the current dataset it appeared that it was only possible to analyse the health and patient characteristics. Data on the latest measurements and scores on these measures were only available on practice level, so this could not be linked to a specific patient to determine the development in their disease (either progression or regression). The results presented in this study are therefore cross-sectional.

Recommendations for practice

Based on this research some recommendations for practice can be made. The results of this study show that there is a difference between the higher and lower SES individuals in health in Almelo on several characteristics. The differences between higher and lower SES individuals can possibly be reduced by taking preventive measurements on BMI and age at onset. Improving the health status of the lower SES individuals will help to reduce the differences with the higher SES individuals. Classic examples of improving health are more physical activity, better nutrition and better knowledge about health. Although classic examples these interventions have been found to improve one's health. In light of the targeted audience it can be questioned if such a program needs to be offered with their GP, or that other organisations, companies or (social) influencers can play a role in offering and promoting such a program.

Another recommendation that can be made for practice is to start collecting longitudinal data of patients enrolled in a disease management program and utilization of the

offered services in these programs. By doing so, a better insight in the quality of the offered programs will rise and improvements can be made. The indicators that are currently collected for the InEen Benchmark are data on GP practice level. This already gives insight the quality of the offered program, but these are general numbers which cannot be linked to a patient. Linking these data to the specific patient will help to gather insight in the quality of the services and the services used by specific groups of patients (i.e. higher/lower educated patients, patients older/ younger than 65 years, patients who measure their blood glucose daily/weekly).

On a broader level, it can be recommended to take SES into account in the preventive screening for diseases in which lifestyle factors play an important role in the development of the disease, such as colorectal cancer. As shown in this study there is a significant relation between BMI and SES and between age at onset and SES. Based on these results and the existing body of literature about this, it is likely that these factors also influence the development of other diseases affected by lifestyle factors, as colorectal cancer. Further research to determine which disease are mainly affected by lifestyle factors and to what extent SES plays a role in developing these disease is recommended before adjusting screening guidelines.

Recommendations for further research

Based on the results and experiences within this research some recommendations for further research can be made. Where in the first instance the data in this study seemed quite optimal, during the study it appeared that there were missing some insights in this dataset. Determining whether lower SES individuals experience a reduced access to healthcare or if lower SES individuals make use of other services in the disease management program than higher SES individuals was not possible within this data. For further research it is recommended to dive deeper into the characteristics of the disease management programs and of the patients included in order to determine on which levels there exist discrepancies between higher and lower SES individuals, since it have become clear in this research that there are differences among lower and higher SES individuals included in the disease management programs.

Conclusion

Goal of this research was to determine if there was a difference between higher and lower SES individuals in Almelo who are participating in the DMPs of DM or CVRM. To determine this it was first researched what the prevalence of DM and CVD are among the higher and lower SES individuals. The prevalence of both DM and CVD appeared to be higher among lower SES individuals. Estimations on the prevalence in 2020 show that this difference will remain between higher and lower SES individuals. The second question that was asked was what the rate of enrolment and drop-out rate of the concerning DMPs was among higher and lower SES individuals. In the DM disease management program there were more lower SES individuals enrolled in the program, whereas in the CVRM disease management program the enrolment rate among higher SES individuals was higher, although on both were not significant. Eventually, the patient characteristics of the patients enrolled in the disease management program are compared between higher and lower SES individuals. On the patient characteristics significant relations between SES and BMI were found in the DM disease management program; a significant relation between age at onset and SES was found in the CVD component of CVRM disease management program; in the increased vascular risk component of the CVRM program significance relations between SES, age, age at onset and BMI were found.

List of abbreviations

CVD	cardiovascular disease
CVRM	cardiovascular risk management
DM	diabetes mellitus
DMP	disease management program
FEA	Federatie Eerstelijnszorg Almelo e.o.
RA	rheumatoid arthritis
SES	socioeconomic status

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Attachments

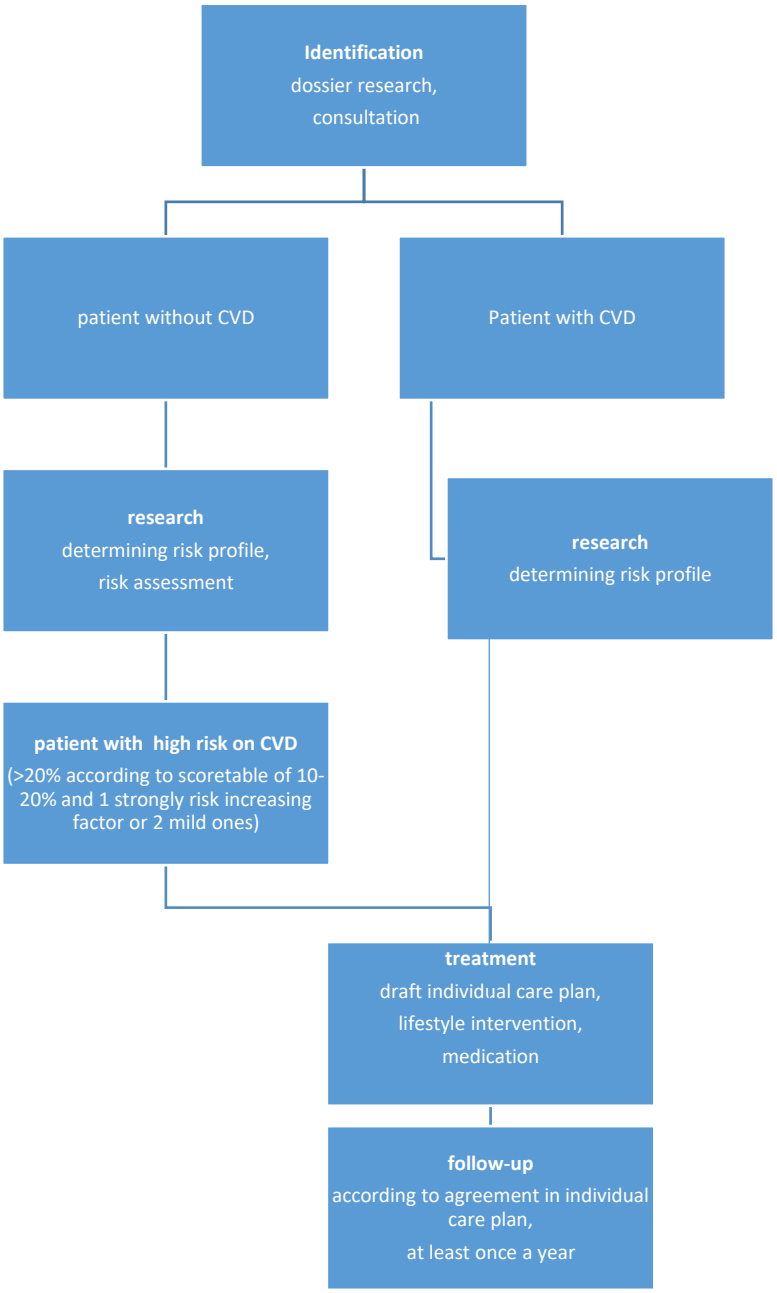
Attachment 1
GP practices located in Almelo and the offered disease management programs

Table 1: Postal code location of physician practices in Almelo and the disease management programs they offer (67)

Physician(practice)	Location - postal code	Disease management programs
Huisartsenpraktijk Arninkhof & Roelink	7606	Diabetes, CVRM
Huisartsenpraktijk Bellavista	7604	Diabetes, CVRM
Huisartsenpraktijk Groenewold	7601	Diabetes, COPD, CVRM, elderly care
Huisartsenpraktijk Hendriks & Olthuis	7606	Diabetes, COPD, CVRM
Huisartsenpraktijk Heikens	7607	Diabetes, COPD, CVRM, elderly care
Huisartsenpraktijk Hofman	7607	Diabetes, COPD, CVRM elderly care
Huisartsenpraktijk de Kolk	7607	Diabetes, COPD, CVRM, elderly care
Huisartsenpraktijk Kral	7606	Diabetes, COPD, CVRM, elderly care
Huisartsenpraktijk Kwee	7607	Diabetes, CVRM, elderly care
Huisartsenpraktijk Meijer	7604	Diabetes, COPD, CVRM
Praktijk de Noordrand	7602	Diabetes, CVRM, elderly care
Huisartsenpraktijk Rauws	7607	Diabetes, COPD, CVRM, elderly care
Praktijk Rosarium	7602	Diabetes, COPD, CVRM, elderly care
Huisartsenpraktijk de Schelfhoed	7608	Diabetes, COPD, CVRM
Praktijk Sluitersveld	7603	Diabetes, CVRM, elderly care
Huisartsenpraktiijk Timmer	7604	Diabetes, COPD, CVRM, elderly care

Huisartsenpraktijk Windmolenbroek	7609	Diabetes, COPD, CVRM, elderly care

Attachment 2
Graphic representation of the inclusion procedure in the CVRM disease management program (68)



Attachment 3

Descriptive statistics on disease management program for diabetes mellitus and cardiovascular risk management

Descriptive statistics on increased vascular risk

Table 1: BMI of the individuals enrolled in the program comparing individuals who dropped out of the program.

BMI	Enrolled	Dropped out
Total		
Mean ± std. error	29,23 ± 0,18	30,39 ± 0,63
95% CI		
Lower bound	28,89	29,14
Upper bound	29,58	31,65
Median ± STD	28,50 ± 5,34	30,15 ± 5,99
Variance	28,54	35,91
Lower SES		
Mean ± std. error	31,98 ± 0,22	30,57 ± 1,08
95% CI		
Lower bound	31,55	28,32
Upper bound	32,48	32,81
Median ± STD	31,20 ± 5,93	30,30 ± 5,19
Variance	35,160	26,91
Higher SES		
Mean ± std. error	28,44 ± 0,25	28,75 ± 0,83
95% CI		
Lower bound	27,95	27,06
Upper bound	28,92	30,44
Median ± STD	27,80 ± 4,42	27,60 ± 5,08
Variance	19,55	25,79

Table 2: Age of the individuals enrolled in the program comparing individuals who dropped out of the program.

Age	Enrolled	Dropped out
Total		
Mean ± std. error	60,43 ± 0,20	57,36 ± 0,53
95% CI		
Lower bound	60,03	56,32
Upper bound	60,83	58,40
Median ± STD	62,00 ± 6,73	57,00 ± 7,61
Variance	45,35	57,95
Lower SES		
Mean ± std. error	58,47 ± 0,30	55,18 ± 1,62
95% CI		
Lower bound	57,87	51,91
Upper bound	59,07	58,45
Median ± STD	60,00 ± 8,38	59,00 ± 10,76
Variance	70,23	115,69
Higher SES		
Mean ± std. error	61,48 ± 0,32	59,01 ± 0,83

95% CI		
Lower bound	60,85	57,36
Upper bound	62,10	60,67
Median ± STD	63,00 ± 6,06	60,00 ± 7,08
Variance	36,80	50,12

Table 3: Sex of the individuals enrolled in the program comparing individuals who dropped out of the program.

Sex	**Enrolled**	**Dropped out**
Total		
Female % (ABS)	48,98% (529)	45,67 % (95)
Men % (ABS)	51,02% (551)	54,33% (113)
Total % (ABS)	100% (1080)	100% (208)
Lower SES		
Female % (ABS)	46,68% (351)	43,18% (19)
Men % (ABS)	53,32% (401)	56,82% (25)
Total % (ABS)	100% (752)	100% (44)
Higher SES		
Female % (ABS)	42,62 % (156)	32,88% (24)
Men % (ABS)	57,38 % (210)	67,12% (49)
Total % (ABS)	100% (366)	100% (73)

Table 4: Number of patients who are enrolled in the program compared with number of patients who dropped out per GP practice

GP practice	**Enrolled**	**Dropped out**
A	68,47% (76)	31,53% (35)
B	93,24% (69)	6,76% (5)
C	90,21% (129)	9,79% (14)
D	82,55% (175)	17,45% (37)
F	97,59% (81)	2,41% (2)
G	93,33% (84)	6,67% (6)
H	87,10% (54)	12,90% (8)
I	76,34% (71)	23,66% (22)
J	79,44% (85)	20,56% (22)
K	84,54% (82)	15,46% (15)
L	72,99% (100)	27,00% (37)
M	93,67% (74)	6,33% (5)
	1080	208

Table 5: Characteristics of the patients in higher and lower SES status postal codes who are enrolled in the disease management program compared to individuals who dropped out of the disease management program

Total	**Enrolled**	**Dropped out**
Age M ± SD (min. – max.)	60,43 ± 6,73 33 – 69	57,36 ± 7,61 18 -69
Sex		
Female % (ABS)	49,0% (529)	45,7% (95)
Men % (ABS)	51,0% (551)	54,3% (113)
BMI M ± SD (min. – max.)	29,26 ± 5,26 16,70 – 58,50	30,39 ± 5,99 19,80 – 53,10
Number of appointments M (min.-max.)	1,95 ± 1,57 0 - 11	0,67 ± 1,22 0 - 6
Date of inclusion	31 March 2014 – 28 December 2016	01 April 2014 – 28 December 2016
Date of exclusion	-	05 January 2016 – 28 December 2016
Lower SES		
Age M ± SD (min. – max.)	59,90 ± 7,00 33 - 69	56,46 ± 7,76 18 - 69
Sex		
Female % (ABS)	52,2% (373)	52,6 % (71)
Men % (ABS)	47,8% (341)	47,4 % (64)
BMI M ± SD (min. – max.)	29,71 ± 5,61 16,70 – 58,50	31,54 ± 6,36 20,70 – 53,10
Number of appointments M ± SD (min. – max.)	1,62 ± 1,33 0 -9	0,41 ± 0,88 0 - 6
Date of inclusion (min. – max.)	31 March 2014 – 28 December 2016	01 April 2014 – 28 December 2016
Date of exclusion	-	14 January 2016 – 10 May 2016
Higher SES		
Age (M ± SD) (min.-max.)	61,48 ± 6,06 41 - 69	59,01 ± 7,08 42 - 69
Sex		
Female % (ABS)	42,6% (156)	32,9% (24)
Men % (ABS)	57,4 % (210)	67,1% (49)
BMI (M ± SD) [min.-max.]	28,44 ± 4,42 18,80 – 44,70	28,75 ± 5,08 19,80 – 39,20
Number of appointments M ± SD (min. – max.)	2,59 ± 1,78 0 -11	1,15 ± 1,56 0 - 6
Date of inclusion (min.-max.)	30 March 2015 – 14 December 2016	01 April 2015 – 26 November 2016
Date of exclusion (min.-max.)	-	05 January 2016- 19 December 2016

Descriptive statistics on cardiovascular disease

Table 6: BMI of the individuals enrolled in the program comparing individuals who dropped out of the program.

BMI	Enrolled	Dropped out
Total		
Mean ± std. error	28,02 ± 0,25	28,70 ± 0,98
95% CI		
Lower bound	27,53	26,70
Upper bound	28,50	30,70
Median ± STD	27,60 ± 4,77	27,25 ± 5,54
Variance	22,73	30,72
Lower SES		
Mean ± std. error	27,79 ± 0,36	30,20 ± 1,45
95% CI		
Lower bound	27,08	27,16
Upper bound	28,50	33,24
Median ± STD	27,60 ± 5,11	30,11 ± 6,30
Variance	26,07	39,73
Higher SES		
Mean ± std. error	28,13 ± 0,37	26,51 ± 0,92
95% CI		
Lower bound	27,40	24,50
Upper bound	28,85	28,51
Median ± STD	27,65 ± 4,83	26,22 ± 3,31
Variance	23,31	10,99

Table 7: Age of the individuals enrolled in the program comparing individuals who dropped out of the program.

Age	Enrolled	Dropped out
Total		
Mean ± std. error	59,29 ± 0,32	57,86 ± 0,82
95% CI		
Lower bound	58,66	56,24
Upper bound	59,92	59,49
Median ± STD	60,00 ± 6,68	59,50 ± 7,02
Variance	44,67	49,35
Lower SES		
Mean ± std. error	58,76 ± 0,45	57,91 ± 1,09
95% CI		
Lower bound	57,88	55,71
Upper bound	59,64	60,12
Median ± STD	60,00 ± 7,09	59,50 ± 7,42
Variance	50,29	55,10
Higher SES		
Mean ± std. error	60,00 ± 0,44	57,79 ± 1,22
95% CI		
Lower bound	59,13	55,29
Upper bound	60,87	60,29
Median ± STD	60,00 ± 6,04	59,50 ± 6,45
Variance	36,43	41,58

Table 8: Sex of the individuals enrolled in the program comparing individuals who dropped out of the program

Sex	Enrolled	Dropped out
Total		
Female % (ABS)	40,3% (176)	32,4% (24)
Men % (ABS)	59,7% (261)	67,6% (50)
Lower SES		
Female % (ABS)	40,6% (102)	37,0% (17)
Men % (ABS)	59,4% (149)	63,0% (29)
Higher SES		
Female % (ABS)	39,8% (74)	25,0% (7)
Men % (ABS)	60,2% (112)	75,0% (21)

Table 9: Number of patients who are enrolled in the program compared with number of patients who dropped out per GP practice

GP practice	Enrolled	Dropped out
A	74% (39)	26% (14)
B	89% (33)	11% (4)
C	79% (37)	21% (10)
D	76% (47)	24% (15)
F	97% (38)	3% (1)
G	97% (31)	3% (1)
H	94% (30)	6% (2)
I	83% (48)	17% (10)
J	77% (24)	23% (7)
K	90% (27)	10% (3)
L	85% (23)	15% (4)
M	95% (60)	5% (3)

Table 10: Characteristics of the patients in higher and lower SES status postal codes who are enrolled in the disease management program compared to individuals who dropped out of the disease management program

Total	**Enrolled**	**Dropped out**
Age M ± SD	59,29 ± 6,68	57,86 ± 7,02
(min. – max.)	33 - 69	35 - 69
Sex		
Female % (ABS)	40,3% (176)	32,4% (24)
Men % (ABS)	59,7% (261)	67,6% (50)
BMI M ± SD	28,01 ± 4,76	28,70 ± 5,54
(min. – max.)	14,90 – 47,32	14,24 – 42,70
Number of appointments	2,11 ± 1,69	0,78 ± 1,33
M (min.-max.)	0 - 8	0 - 6
Date of inclusion	31 March 2014- 28 December 2016	01 April 2014 - 09 September 2016
Date of exclusion	-	24 January 2016 – 22 December 2016
Lower SES		
Age M ± SD	58,76 ± 7,09	57,91 ± 7,42
(min. – max.)	33 - 69	35 - 69

Sex		
Female % (ABS)	40,6% (102)	37,0% (17)
Men % (ABS)	59,4% (149)	63,0% (29)
BMI M ± SD	27,92 ± 4,72	30,20 ± 6,30
(min. – max.)	14,90 – 47,32	14,24 – 42,70
Number of appointments	1,59 ± 1,22	0,50 ± 0,81
M ± SD	0 - 6	0 - 3
(min. – max.)		
Date of inclusion (min. – max.)	31 March 2014 – 28 December 2016	01 April 2014 – 09 September 2016
Date of exclusion	-	24 January 2016 – 22 December 2016
Higher SES		
Age (M ± SD)	60,00 ± 6,04	57,79 ± 6,45
(min.-max.)	43 - 69	46 - 69
Sex		
Female % (ABS)	39,8% (74)	25,0% (7)
Men % (ABS)	60,2% (112)	75,0% (21)
BMI (M ± SD)	28,13 ± 4,83	26,51 ± 3,31
[min.-max.]	18,00 – 42,57	20,70 – 32,28
Number of appointments	2,81 ± 1,97	1,25 ± 1,82
M ± SD	0 - 8	0 -6
(min. – max.)		
Date of inclusion (min.-max.)	26 March 2015- 08 December 2016	01 April 2015 - 31 May 2016
Date of exclusion (min.-max.)	-	26 January 2016 – 31 October 2016

Descriptive statistics on diabetes mellitus

Table 11: BMI of the individuals enrolled in the program comparing individuals who dropped out of the program.

BMI	**Enrolled**	**Dropped out**
Total		
Mean ± std. error	31,59 ± 0,18	31,22 ± 0,76
95% CI		
Lower bound	31,34	29,67
Upper bound	31,94	32,77
Median ± STD	30,80 ± 6,15	31,25 ± 4,90
Variance	37,90	24,02
Lower SES		
Mean ± std. error	32,07 ± 0,24	30,57 ± 1,08
95% CI		
Lower bound	31,60	28,32
Upper bound	32,53	32,81
Median ± STD	31,20 ± 6,37	30,30 ± 5,18
Variance	40,60	26,91
Higher SES		
Mean ± std. error	30,80 ± 0,27	32,05 ± 1,06
95% CI		
Lower bound	30,36	29,81

Upper bound	31,33	34,30
Median ± STD	30,10 ± 5,70	32,68 ± 4,52
Variance	32,54	20,40

Table 12: Age of the individuals enrolled in the program comparing individuals who dropped out of the program.

Age	**Enrolled**	**Dropped out**
Total		
Mean ± std. error	58,54 ± 0,24	56,00 ± 1,15
95% CI		
Lower bound	58,08	53,70
Upper bound	59,01	58,30
Median ± STD	60,00 ± 8,21	59,50 ± 10,07
Variance	67,35	101,39
Lower SES		
Mean ± std. error	58,47 ± 0,30	55,18 ± 1,62
95% CI		
Lower bound	57,87	51,91
Upper bound	59,07	58,45
Median ± STD	60,00 ± 8,38	59,00 ± 10,76
Variance	70,17	115,69
Higher SES		
Mean ± std. error	58,66 ± 0,37	57,13 ± 1,60
95% CI		
Lower bound	57,92	53,85
Upper bound	59,39	60,40
Median ± STD	60,00 ± 7,92	60,50 ± 9,09
Variance	62,73	82,56

Table 13: Sex of the individuals enrolled in the program comparing individuals who dropped out of the program

Sex	**Enrolled**	**Dropped out**
Total		
Female % (ABS)	46,1% (555)	36,8% (28)
Men % (ABS)	53,9% (648)	63,2% (48)
Lower SES		
Female % (ABS)	46,7% (352)	43,2% (19)
Men % (ABS)	53,5% (401)	56,8% (25)
Higher SES		
Female % (ABS)	45,1% (203)	28,1% (9)
Men % (ABS)	54,9% (247)	71,9% (23)

Table 14: Number of patients who are enrolled in the program compared with number of patients who dropped out per GP practice

GP practice	**Enrolled**	**Dropped out**
A	88% (87)	12% (12)
B	89% (47)	11% (6)
C	96% (109)	4% (4)
D	96% (134)	4% (5)
F	91% (74)	9% (7)

G	96% (92)	4% (4)
H	96% (54)	4% (2)
I	96% (72)	4% (3)
J	96% (90)	4% (4)
K	92% (82)	8% (7)
L	92% (192)	8% (16)
M	98% (99)	2% (2)

Table 15: Characteristics of the patients in higher and lower SES status postal codes who are enrolled in the disease management program compared to individuals who dropped out of the disease management program

Total	**Enrolled**	**Dropped out**
Age M ± SD **(min. – max.)**	58,54 ± 8,20 21 - 69	56,00 ± 10,06 22 – 69
Sex **Female % (ABS)** **Men % (ABS)**	 46,1% (555) 53,9% (648)	 36,8% (28) 63,2% (48)
BMI M ± SD **(min. – max.)**	31,53 ± 5,87 17,20 – 54,20 -	31,22 ± 4,90 22,00 – 43,85
Number of appointments **M (min.-max.)**	5,92 ± 4,89 0 - 110	2,33 ± 5,08 0 - 38
Date of inclusion	05 November 2003 – 22 December 2016	02 December 2003 – 15 November 2016
Date of exclusion	-	07 January 2016 – 21 December 2016
Lower SES		
Age M ± SD **(min. – max.)**	58,47 ± 8,38 21 - 69	55,18 ± 10,76 22 –68
Sex **Female % (ABS)** **Men % (ABS)**	 46,7% (352) 53,3% (401)	 43,2% (19) 56,8% (25)
BMI M ± SD **(min. – max.)**	31,98 ± 5,92 19,00 – 54,20	30,57 ± 5,19 22,40 – 43,85
Number of appointments **M ± SD** **(min. – max.)**	5,76 ± 5,40 0 - 110	1,19 ± 1,53 0 -5
Date of inclusion (min. – max.)	20 December 2005 – 22 December 2016	20 December 2005 – 20 May 2016
Date of exclusion	-	07 January 2016- 20 December 2016
Higher SES		
Age (M ± SD) **(min.-max.)**	58,66 ± 7,92 25 - 69	57,12 ± 9,09 35 - 69
Sex **Female % (ABS)** **Men % (ABS)**	 45,1% (203) 54,9% (247)	 28,1% (9) 71,9% (23)
BMI (M ± SD) **[min.-max.]**	30,80 ± 5,70 17,20 – 50,20	32,06 ± 4,52 22,00 – 38,93

Number of appointments M ± SD (min. – max.)	6,18 ± 3,89 0 – 39	3,88 ± 7,36 0 - 38
Date of inclusion (min.-max.)	06 November 2003 – 19 December 2016	02 December 2003 – 15 November 2016
Date of exclusion (min.-max.)	-	11 January 2016 – 21 December 2016