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Comparative Analysis of Delivery of Primary Eye Care in Three European Countries

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Comparative Analysis of Delivery of Primary Eye Care in Three European Countries

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List of abbreviations

ABDO	Association of British Dispensing Opticians
AMD	Age-related macular degeneration
AOF	Association des Optométristes de France
AOP	Association of Optometrists
Bac	Baccalauréat
Bac-Pro	Baccalauréat Professionelle
Bac-S	Baccalauréat Scientifique
Bac-STI	Baccalauréat Sciences et Technologies Industrielles
Bac-STL	Baccalauréat Sciences et Technologies de Laboratoire
BEP	Brevet d'Études Professionelle
BMA	British Medical Association
BSc	Bachelor of Science
BTS-OL	Brevet de Technicien Supérieur d'Opticien-Lunetier
BVA	Berufsverband der Augenärzte Deutschlands
CANAM	Caisse Nationale d'Assurance Maladie des Professions Indépendantes
CAP	Certificat d'Aptitude Professionelle
CCT	Certificate of Completion of Training
CET	Continuing Education and Training
CHF	Swiss franc
CL	Contact lenses
CMU	Couverture Maladie Universelle
CMU-C	Couverture Maladie Universelle Complémentaire
CNAMTS	Caisse Nationale d'Assurance Maladie des Travaileurs Salariés
CNFMC	Conseils Nationaux de la Formation Médicale Continue
CQP	Certificat de Qualification Professionelles
CSP	Code de la Santé Publique
CSS	Code de la Securité Sociale
DCEM	Deuxième Cycle d'Études Médicales
DES	Diploma d'Études Specialises
DipHE	Diploma of Higher Education
DOG	Deutsche Ophthalmologische Gesellschaft

DRCOphth	Diploma of the Royal College of Ophthalmologists
DREES	Direction de la Recherche, des Études, de l'Évaluation et des Statistiques
DU	Diplôme d'Université
e.g.	exempli gratia
ECOO	European Council of Optometry and Optics
EMBASE	Excerpta Medica Database
et al.	et alii / et aliae / et alia
etc.	et cetera
FBDO	Fellowship Diploma of the Association of British Dispensing Opticians
FBDO CL	Contact Lens Certificate of the Association of British Dispensing Opticians
FBDO (Hons) CL	Diploma in Advanced Contact Lens Practice of the Association of British Dispensing Opticians
FH	Fachhochschule
FODO	Federation of Ophthalmic and Dispensing Opticians
FR	France
FRCOphth	Fellowship of the Royal College of Ophthalmologists
GCSE	General Certificate of Secondary Education
GDP	Gross domestic product
GDR	German Democratic Republic
GER	Germany
GfK	Gesellschaft für Konsumforschung
GMC	General Medical Council
GOÄ	Gebührenordnung für Ärzte
GOS	General Ophthalmic Services
GOC	General Optical Council
GP	General Practitioner
GSL	General Sale List
HAS	Haute Autorité de Santé
HES	Hospital Eye Service
HwK	Handwerkskammer
HwO	Handwerksordnung

i.e.	id est
IGeL	Individuelle Gesundheitsleistungen
incl.	including
km²	Square kilometres
KV	Kassenärztliche Vereinigung
KVG	Krankenversicherungsgesetz
Licence-Pro	Licence d'Optique Professionelle
MedBG	Medizinalberufegesetz
MOptom	Master of Optometry
MRCOphth	Membership of the Royal College of Ophthalmologists
MSA	Mutualité Sociale Agricole
n.a.	not available
NHS	National Health Service
OECD	Organisation for Economic Co-Operation and Development
OHT	Ocular hypertension
OMP	Ophthalmic Medical Practitioner
OST	Ophthalmic Specialist Training
P medicines	Pharmacy medicines
PCEM	Première Cycle d'Études Médicales
PCT	Primary Care Trust
PEARS	Primary Eyecare Acute Referral Scheme
POAG	Primary open angle glaucoma
POM	Prescription only medicines
PPP	Purchasing power parities
RCO	Royal College of Ophthalmologists
s.	section
SAS	Staff and associate specialists
SGB V	Fünftes Sozialgesetzbuch
SHA	Strategic Health Authority
SHI	Statutory Health Insurance
SNOF	Syndicat National des Ophtalmologistes de France
SOV	Schweizer Optikerverband
TCEM	Troisième Cycle d'Études Médicales

UE	Unités d'Enseignements
UK	United Kingdom
UNCAM	Union Nationale des Caisses d'Assurances Maladie
US	United States
Var.	Variation
VDCO	Vereinigung Deutscher Contactlinsen-Spezialisten und Optometristen
ver.di	Vereinte Dienstleistungsgewerkschaft
WCO	World Council of Optometry
WEHE	Welsh Eye Examination
WVAO	Wissenschaftliche Vereinigung für Augenoptik und Optometrie
ZDH	Zentralverband des Deutschen Handwerks
ZVA	Zentralverband der Augenoptiker Deutschlands

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Executive summary

1. The organisation of primary eye care services in Europe is not uniform. While in some countries primary eye care is exclusively within the scope of practice of ophthalmologists, other systems rely on a variety of different professions providing essential parts of primary eye and vision health care. The study at hand addresses the question whether costs and outcomes of primary eye care services differ between heterogeneously organised systems. Therefore a special focus on the participation of opticians and optometrists was set. Having similar populations and economic conditions, but differently organised eye care systems, the countries France, Germany and the UK were exemplarily analysed as target countries. Based on an initial description of the different primary eye care systems, a criteria-based evaluation of costs and outcomes was conducted. Information was gained by expert-interviews and a systematic literature search in the Scorpus database alongside with unsystematic Internet searches.
2. France, Germany and the UK show archetypical differences with regard to the construction of primary eye care. Whereas in France services are almost exclusively provided by ophthalmologists, in the UK academically educated optometrists are the main primary eye care providers. The German system is a mixed model, where ophthalmologists as well as optometrists[1] provide essential elements of primary eye care.
3. The Regulative framework, education and scope of practice of ophthalmologists – or ophthalmic medical practitioners in the UK – are very similar in all three countries. Ophthalmologists provide a complete range of ophthalmic services based on their long and comprehensive university education. However, the numbers of active ophthalmologists differs significantly between the compared countries, which lead to different roles of the ophthalmologists in the organisation of primary eye care.
4. In contrast, there are considerable differences between the regulative framework, the education and the scope of practice of the opticians' profession in the analogue countries. In France opticians (*Brevet de Technicien Supérieur d'Opticien-Lunetier*) are trained two years in private or public settings. Their role in primary eye care is

[1] Optometrists in the sense of *Augenoptikermeister* or equivalent qualifications. Please see chapter 3.2.2.2. for the restrictions of this designation.

basically the fitting and supply of optical appliances – completed by the capability of performing refractive services since 2007. Recently an increased development of French opticians towards optometry is notable. These opticians pass different forms of postgraduate training to extend their abilities and optometric knowledge. However, this additional training is not accompanied by enlarged competencies as the optometric profession is not officially acknowledged in the French system so far. The main primary eye care provider in France remains the ophthalmologist.

5. In Germany it has to be distinguished between dispensing opticians (*Augenoptikergesellen*) and optometrists (*Augenoptikermeister or equivalent training route*). After a three year training, German dispensing opticians have similar competencies as French opticians. The subsequent postgraduate training routes to become optometrist extend the capabilities of German optometrists towards inter alia the fitting of contact lenses and the screening for abnormalities of the eye. There is a large variety of training routes leading to a qualification as optometrist which differ in length and depth of education. This causes a remarkable heterogeneity in the German optometric profession. As in France, the title "optometrist" is neither secured nor officially acknowledged in the German system by today. The primary eye care scheme in Germany consequently bases on a side by side workforce of ophthalmologists and dispensing opticians and optometrists. Medical competencies exclusively lay in the responsibility of ophthalmologists.
6. In contrast to these two systems, which base on a strong influence of ophthalmologists, the UK-systems is built on a strong position of optometrists who provide almost all sight tests and eye examinations in primary eye care. Ophthalmic medical practitioners play only a minor role due to a very small number. Moreover, UK is the only country where dispensing opticians – who are comparable to their French and German counterparts – as well as optometrists are educated homogeneously; with the majority trained in university settings. Additionally only in the UK the title "optometrist" is secured. In consistence with a more comprehensive education, UK optometrists show an extended range of competencies in comparison to their German counterparts by being entitled to determine diagnoses or to use diagnostic therapeutic agents.
7. A criterion-based comparison regarding structure-, process-, and outcome-based parameters as well as economic and financial aspects was conducted basing on the

description of the three different primary eye care systems. Analysed criteria have been inter alia the headcounts of participating primary eye care professionals, the existence of waiting times, the existence of measures of consumer protection, the quality of services as well as the costs of eye examinations, the costs of optical appliances and the costs of education of primary eye care providers. The criterion-based comparison of the three different primary eye care systems has led to the following results.

8. All three systems will face an increasing demand of eye and vision health care in the future mainly conditioned by the demographic development of the populations. This trend is accompanied by decreasing headcounts of primary eye care providers in France, which led to a significantly below average number of professionals per 100,000 population in comparison to the two other countries. In Germany and the UK the numbers of primary eye care providers have been stable or slightly increasing over the past ten years. Future predictions lead to the assumption of further decreasing numbers of professionals in France, stable figures in the UK and uncertain projections for the German system.[2]
9. These tendencies are confirmed by an analysis of current waiting time for primary eye care in the three target countries. In France 3-month waiting times for ophthalmologic consultations are the rule. Partly waiting times up to twelve month have been reported. In Germany and the UK no general waiting times have been noted in primary eye care. This situation implies a more comfortable access to care in Germany and the UK than in France. With regard to consumer protection and quality of services no considerable differences between the three countries were determinable, although it became obvious that the UK-system is the most strictly and uniformly regulated system. The evaluation of the quality of services performed by the different primary eye care providers had shown that adequately educated health care professionals – like the UK optometrists – are capable of performing high quality primary eye care. In this context the quality of services performed by ophthalmologists was not called into question.
10. The comparison of economic and financial criteria has yielded no significant differences between the analogue countries. The evaluation of costs of services, i.e.

[2] This uncertainty is owed to incomplete data sets about the development of numbers of German ophthalmologists.

eye examinations, revealed a limited willingness to pay by statutory health systems for such services. Independently from the providing eye care professional, a maximum eye examinations fee of 33 € was found in all three countries. Comparable data has also been noted regarding the income of the different eye care professionals. Slight differences were remarkable in the evaluation of costs for optical appliances, showing that prices in the UK seem to be below the prices in Germany and France, albeit the comparison was subject to considerable limitations. In addition, differences were identified in the analysis of the costs of education of the different primary eye care providers. However, these differences were not system-related, but based on the varying form of training between ophthalmologists on the one hand and opticians and optometrists on the other hand. It was assessed that the costs of educating opticians and optometrists are substantially below the costs of educating ophthalmologists, albeit these facts were only provable in the German system due to incomplete data-sets. In total a clear superiority or inferiority of one of the analogue countries and their systems was not determined in the evaluation of cost-related criteria.

11. The results of this study were subject to considerable limitations. Appropriate information was only available to a limited extent and most information was gained by expert interviews and Internet searches, which generates the risk of information and interview bias. To improve the quality of the results only objective answers and articles had been considered, whereas political or valuing statements were not included into the study. In addition there was the fact that the opticians' profession in France and Germany is in a phase of reconstruction, which evoked inaccuracies that complicated the comparison.
12. Summarising all results it can be stated that none of the systems of the analogue countries shows a significant advantageousness. All three primary eye care models, namely the ophthalmologic model in France, the ophthalmologic/optometric model in Germany and the optometric model in the UK, meet the demands and requirements of industrialised countries and are principally capable of providing high-level quality services to the patient. This is accompanied by easy access to care at similar costs as far as it was assessable in the context of this study. However, it has to be stated that France is facing increasing risks of inadequate access to care due to a too low number of primary eye care providers. But also Germany and the UK face varying

future challenges, which lead to the necessity of continuous development for each system. As shown by the analysis the participation of adequately educated optometrists as comprehensive primary eye care providers – as implemented in the UK-system – leads to adequate eye care without loss of care quality or increased risk for the patients. Thus the extension of opticians' competencies towards optometric services may be an appropriate solution to meet the increasing demand for primary eye care in the French and German system. However, it has to be considered that the participation of opticians and optometrists in primary eye care requires an adequate framework regarding education and scope of practice before transferring further responsibilities to the optical professions.

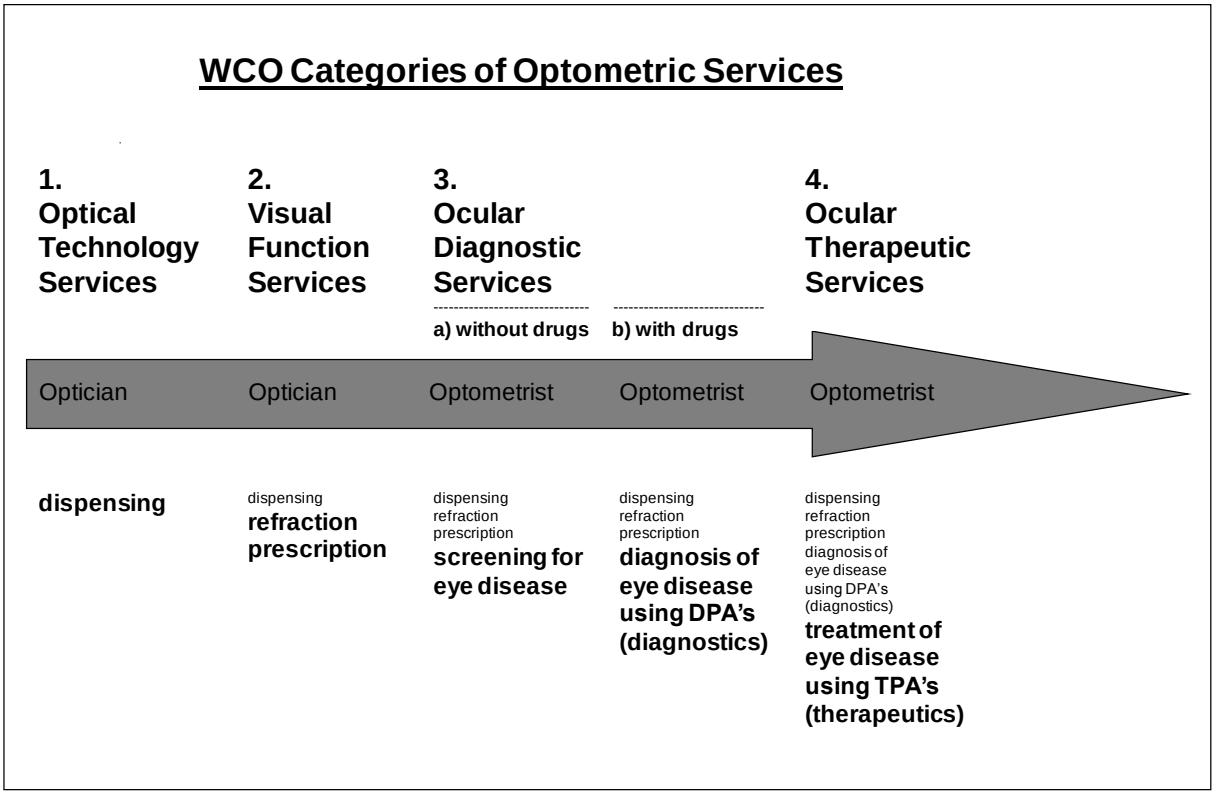
1. Background and objectives

"Ophthalmic primary care is the provision of first contact care for all ophthalmic conditions and the follow-up, preventive and rehabilitative care of selected ophthalmic conditions."

This definition of primary eye care was proposed by Riad et al. [2003]. The construction of primary eye care services is highly variable throughout Europe. While in some European countries primary eye care services are provided exclusively by ophthalmologists, in other countries there is a variety of different professions who provide essential elements of eye and vision health care. The purpose of this study is a comparison of differently organised primary eye care systems, with special focus on the participation of opticians and optometrists.

"*Optometrists are primary health care practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection, diagnosis and management of disease in the eye, and the rehabilitation of conditions of the visual system*" [Woo 2010]. Generally optometry is an advancement of optics, as the education of opticians has expanded to include clinical subjects. As a consequence, the scope of practice of optometrists has been enlarged to the performance of sight tests and comprehensive eye examinations on patients, whereas opticians focus traditionally on the fitting and dispensing of optical appliances. The professions of optometry and optics have evolved at varying speeds within Europe as a result of the extent of available training, the legislation, the organisation of the profession, and the relative size, political weight and attitude of ophthalmology towards optometry [ECOO 2009]. The different stages of the opticians' and optometrists' profession are at best comprehensible following the classification of the World Council of Optometry (WCO), presented by Grit [2008] in Figure 1. In addition to the four categories presented in Figure 1, the WCO included another category into the scheme for those optometrists performing eye surgery by using laser, which is exclusively permitted to optometrists in Oklahoma (US). As this study focuses on primary eye care and the performance of surgeries is not within the traditional scope of pracitce of optometrists, especially in the European area, there will be no further consideration of optometrists performing eye surgeries in this study.

Figure 1: The WCO Categories of Optometric Services



Source: Institute for Health Care Management and Research based on Grit [2008]

Worldwide about 284 million people are visually impaired. Of these 39 million people are blind and 245 million people suffer of low vision[3] [WHO 2011a]. Glaucoma, diabetic retinopathy, age-related macular degeneration and cataract are the most common eye conditions threatening the status of sight in industrialised countries [WHO 2011b]. An emerging cause of visual impairment are uncorrected refractive errors, which are considered as the main reason of preventable blindness worldwide [Woo 2010]. There is considerable evidence that the reduced vision is associated with a significant reduction of quality of life and reduced activity of affected people [Evans, Rowlands 2004]. As most eye conditions are age-related there seem to arise serious future challenges for the European eye care systems with regard to the demographic development most European countries are faced with. Thus, a well-functioning system of (primary) eye care service provision is essential for every health care system.

[3] According to the International Classification of Diseases – 10 (Update and Revision 2006).

Comprehensive evaluations comparing different primary eye care systems have not yet been conducted. As a consequence the European Council of Optometry and Optics (ECOO) has commissioned the Institute for Health Care Management and Research of the University Duisburg-Essen to compile a report assessing clinical and economic outcomes of differently organised primary eye care systems. Exemplarily the countries of France, Germany and the United Kingdom (UK) will be analysed as targeted countries.[4] The countries show comparable populations and economic conditions (see Table 1), but with regard to primary eye care, archetypically different systems exist, namely:

- An ophthalmological model in France
- A mixed optometric/ophthalmological model in Germany
- An optometric model in the UK

Table 1: Key indicators of France, Germany and the UK

	France	Germany	UK
Population (in 2009)	62.799.180	81.802.257	61.792.000
Area (km²)	551.500	357.022	243.610
People per km²	114	229	254
Gross domestic product (2008: in billion US-$; current prices and PPPs[1])	2.121,70	2.909,70	2.186,00
Gross domestic product per capita (2008: in US-$; current prices and PPPs)	33.090,00	35.432,00	35.631,00
[1] PPPs = Purchasing power parities			

Source: OECD [2010a]; CIA [2011]; INSEE [2010]; Statistische Ämter des Bundes und der Länder [2011]; ONS [2010b]

This study addresses the question of whether costs and outcomes of primary eye care services differ between countries with different systems of delivery. To achieve that purpose, the present analysis is devided into four maint parts. Initially there will be a comprehensive description of the different primary eye care systems in the examined countries (see chapter 3). The focus of this first part will lie on an evaluation of the underlying framework for ophthalmic services, the participating professions, their education and scope of practice as well as the organisation of primary and – to a limited extent – secondary eye care services.

[4] In addition there will be a brief abstract about primary eye care in Switzerland (see Appendix 8: Primary eye care in Switzerland).

Accordingly, the study will include information on legislation and regulation, funding, division of labour between the participating eye care providers as well as on questions of access to care, reimbursement of services and licensing as eye care provider.

The second and third main parts of the study will be a criterion-based cross-country comparison of the three countries (see chapter 4). On the one hand we will assess, the degree of deviation between the three primary eye care models regarding structure-, process-, and outcome-based parameters (see chapter 4.1); and on the other hand if and how these differently organised systems influence financial and economic parameters (see chapter 4.2). In the context of structure-, process-, and outcome-based parameters, criteria such as the numbers of eye care providers and their demographic development, the existence of waiting times, the quality of services and the protection of consumers will be analysed. Regarding financial and economic aspects of care the focus is set on criteria such as the costs of services, the costs of optical appliances or the costs of education. A detailed presentation of the selected criteria will follow in chapter 2, which will describe the usedmethods of this evaluation.

The final part (see chapter 5) will bring together all the results of the evaluation and will lead to the possibility of drawing valuing conclusions concerning the influence of the institutional design of the different primary eye care systems (see chapter 6). The compared countries will be assessed regarding their advantages and disadvantages and a particular focus is set on the assessment of the participation of opticians and optometrists in primary eye care schemes.

Whereas Riad et al. consider primary eye care to take place in a variety of settings; this study will focus on a comparison of primary eye care services provided in outpatient settings, although the demarcation to secondary eye care is not precise at some points and there might be services overlapping both fields of provision.

2. Methods

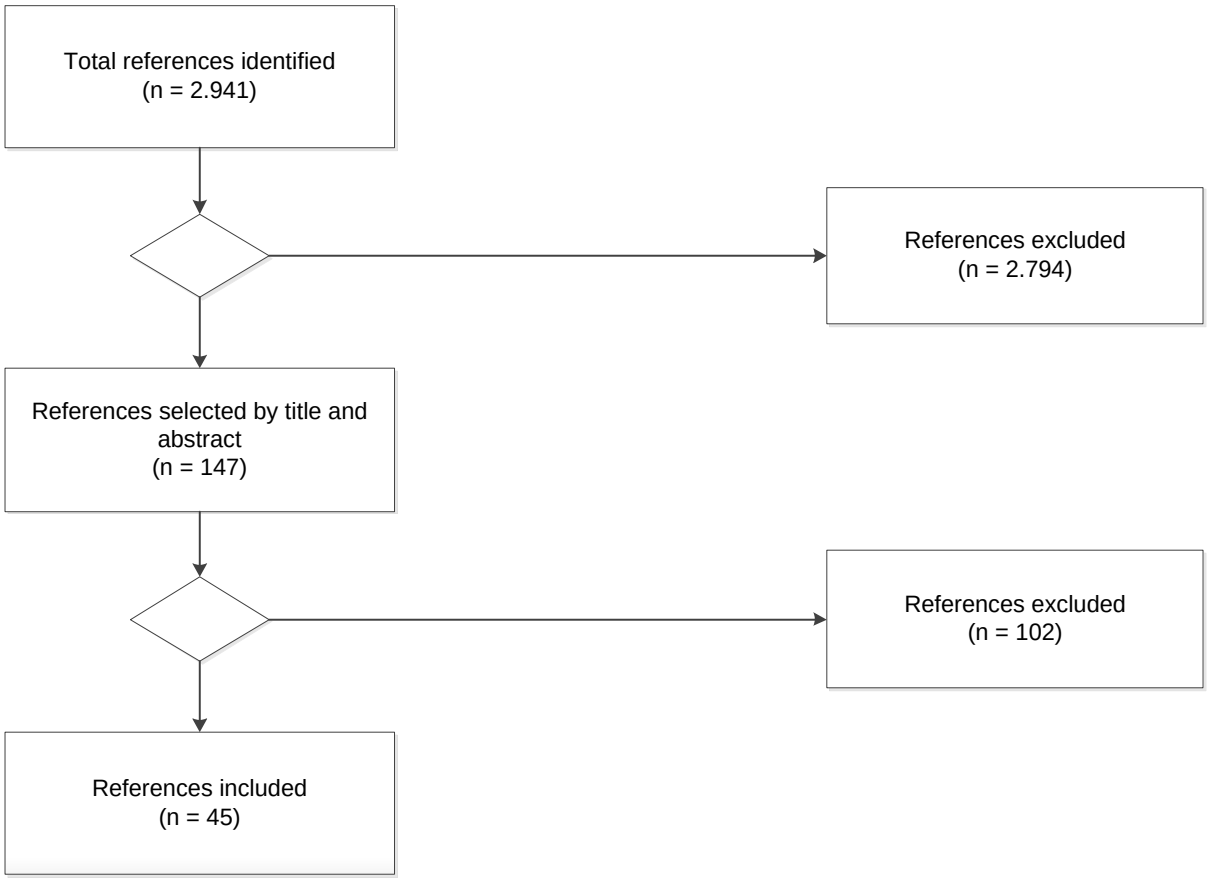
The cross-country comparison analysing the countries of France, Germany and the UK was initiated in July 2010. To analyse and compare the different eye care provision systems concerning the described objects of study, systematic database searches alongside with unsystematic Internet searches have been conducted. To validate the found information and obtain supplementary information country-specific standardised questionnaires have been developed. The progress of this study will be described in more detail in the following paragraphs.

In a first step information was searched about the basic construction of the systems of delivery of primary eye care services before focussing on information which could be used for the criterion-based comparison of the countries.

A systematic literature search in the EMBASE (Excerpta Medica Database) and SciVerse Scopus databases was conducted along with an unsystematic Internet search. The search was restricted to English-, French- or German-language articles. No further limitations were applied, i.e. all papers including adequate information about "eye care services" in the three countries have been taken into account. Keywords referring to the fields of systems' construction, participation and education in primary eye care as well as economics, quality and outcomes were used. A detailed search string is shown in Appendix 1: Systematic database research – search string.

In total 2,941 references were found. The identified references were scanned and evaluated in the desk-research-phase. On the basis of title and abstract the references were pre-selected; references, which remain relevant afterwards, were ordered as full-text. 147 full-texts were ordered and 45 of these were finally included into the report (see Figure 2).

Figure 2: Flow-chart systematic database search



Source: Institute for Health Care Management and Research

Further information was obtained by screening the bibliographies of the papers identified in the systematic database search and by use of statistical databases, guidelines and other literature such as journals of the professionals associations or newspapers. To validate the literature based analysis health care experts and representatives of legislation, regulation boards, payers and providers have been interviewed. Therefore country-specific questionnaires have been developed. The questionnaires consist of five parts, covering aspects of education and training, scope of practice, remuneration, regulative framework and miscellaneous. In addition to the particular country specification, different questionnaires for the respective eye care service providers in the three countries were created (see as an example the questionnaire for the UK dispensing opticians in Appendix 2: Exemplary questionnaire – Dispensing opticians (UK)). A detailed list of contacted institutions is shown in Table 2.

Table 2: List of contacted interview-partners

Country	Profession	Institution	Interviewee	Position	Response		Form
					Yes	No	
France	Health insurance	Santéclair	-	-		X	
France	Research institution	Institut National de la Santé et de la Recherche Médicale	-	-		X	
France	Opticians	Union des opticiens (UDO)	-	-		X	
France	Opticians/Optometrists	Association des Optométristes de France (AOF)	JL Dubié	Secretary General	X		Written answer
France	Ophthalmologists	Syndicat National des Ophtalmologistes (SNOF)	-	-		X	
France	Ophthalmologists	Société Francaise d'Ophtalmologie (SFO)	-	-		X	
Germany	Opticians	Zentralverband der Augenoptiker (ZVA)	S Schubert T Heimbach	Executive board member Executive board member	X		Written answer Telephone interview
Germany	Opticians/Optometrists	Vereinigung Deutscher Contactlinsen-Spezialisten und Optometristen (VDCO)	M Fraatz	Chairman of the executive board	X		Written answer
Germany	Opticians/Optometrists	Wissenschaftliche Vereinigung für Augenoptik und Optometrie (WVAO)	-	-		X	
Germany	Ophthalmologists	Berufsverband der Augenärzte Deutschlands (BVA)	B Bertram C Gante	Chairman of the executive board Deputy chief executive	X		Workshop
Germany	Ophthalmologists	Deutsche Ophthalmologische Gesellschaft (DOG)	-	-		X	
UK	Optometrists	Association of Optometrists (AOP)	G Roberson	Professional Adviser	X		Written answer
UK	Optometrists	College of Optometrists	S Blakeney J Martin	Optometric Adviser Director of Education	X		Written answer
UK	Opticians	College of the Association of British Dispensing Opticians (ABDO College)	J Underwood	Principal	X		Written answer
UK	Opticians/Optometrists	Federation of Ophthalmic and Dispensing Opticians (FODO)	-	-		X	
UK	Opticians/Optometrists	General Optical Council (GOC)	L Kennaugh	Head of Education and Standards	X		Written answer
All	Opticians/Optometrists	European Council of Optometry and Optics (ECOO)	W Cagnolati R Carswell C Müller	Immediate Past president Former Secretary General Vice President (ZVA)	X		Workshop

Source: Institute for Health Care Management and Research

To avoid 'Single Informant Bias' at least two interviews per country and per profession should be performed. Except for France this objective was achieved for all professions in the different countries. The responses were compiled differently. There have been written answers, telephone interviews as well as workshops to discuss the answers. Some of the institutions agreed to participate in the interview sessions, but referred to the answers of other stakeholders as these reflect the institutions' opinion as accurately as possible. In total 9 interviews with 14 experts from the different countries were conducted.

Following the description of the different eye care provision systems, a criterion-based comparison of the three countries was compiled. Criteria were divided into two groups. The first contains structure-, process- and outcome-based criteria; the second group encompasses financial- and economic-related criteria. The following criteria were selected.

Table 3: Criteria selection

Structure-, process- and outcome-based criteria	**Finally included**
1. Demographic development and future need for ophthalmic care	X
2. Ratio of primary eye care providers to population	X
3. Development of figures of primary eye care providers	X
4. Waiting times	X
5. Protection of consumers	X
6. Quality of care	X
7. Outcome based parameters	
Financial and economic criteria	**Finally included**
1. Costs of illnesses	
2. Eye care provision cost share of total health care expenditure	
3. Costs of eye examinations	X
4. Costs of glasses and contact lenses	X
5. Income of primary eye care providers	X
6. Costs of education	X

Source: Institute for Health Care Management and Research

In the progress of the study, three of the initially selected criteria have been excluded from further research. This applies to the criterion 'Outcome based parameters', which was included into the preceding criterion 'Quality of Care' due to several overlaps; the criterion 'Costs of illnesses' was included into the analysis of the criterion 'Demographic development and future need for ophthalmic care'; and the criterion 'Eye care provision cost share of total health care expenditure' had to be extinguished due to non-comparable data. Every

criterion contains a paragraph about "objective and methods" where measures of data acquisition for the specific criterion will be described in more detail.

Data on health related costs was collected in local currencies (€ for France and Germany and £ for the UK). When a translation was necessary, the currency calculator of OANDA.com was applied, using the conversion rate of the 1st January 2011.

3. Description of the eye care provision systems of France, Germany and the United Kingdom

In the following chapter there will be a comprehensive analysis of the construction of the primary eye care systems of France, Germany and the UK. For each of the countries there will be a brief initial description of the underlying health care system before the focus is set on the organisation of eye care services. In the progress of the systems' description aspects of regulative framework, education and scope of practice of the participating professionals and the organisation of primary and secondary eye care services will be analysed. The inquiry will start with the country of France before afterwards the German and finally the UK-system will be evaluated.

3.1. France

The French Health Care System is integrated into a comprehensive Social Security System that was introduced in 1945. In addition to accident insurance, old-age provision and family benefits, health insurance coverage is a central element of social protection and ensures access to health care for the whole population [Sandier et al. 2004; Beske et al. 2005]. Most health insurance coverage is provided by the statutory health insurance scheme (SHI-scheme). Basically, there are four main types of statutory insurance:

- The *Caisse Nationale d'Assurance Maladie des Travailleurs Salariés (CNAMTS),* which covers salaried employees and their dependents (thus, about 80 % of French residents);
- The *Mutualité Sociale Agricole (MSA)* for farmers and agricultural employees;
- The *Caisse Nationale d'Assurance Maladie des Professions Indépendantes (CANAM)* for self-employed persons;
- Other insurance for civil servants and other public sector workers.

About 99 % of the population is covered by the SHI-scheme [Rothgang et al. 2005; Schölkopf 2010]. In 2000, insurance coverage was made mandatory; all residents who are not eligible for coverage by the SHI-scheme (0.4 % of the population) obtain protection under the *Couverture Maladie Universelle* (CMU), which is financed by the state [Durand-Zaleski 2009].

The organisation of the French health care system is widely centralised, with the Ministry of Health and Sports (*Ministère de la Santé et des Sports*) bearing the main responsibility for its administration. Though the government has delegated competencies to different institutions in recent years, the French system still operates under a strong state influence (e.g., regarding determination of contributions, nomination of administrative directors and the monitoring of budgets) [Kaufmann 2006; AOK Bundesverband 2011]. In addition to the Ministry of Health and Sports, the CNAMTS also plays a major role in the organisation of the general statutory health insurance system. The CNAMTS and its national association, the *Union Nationale des Caisses d'Assurances Maladie (UNCAM)*, are responsible for the health benefit basket, reimbursement rates and the determination of out-of-pocket payments. The actual provision of services is managed by primary insurance funds (*Caisse primaire d'assurance maladie*) on the regional and local levels [Kaufmann 2006].

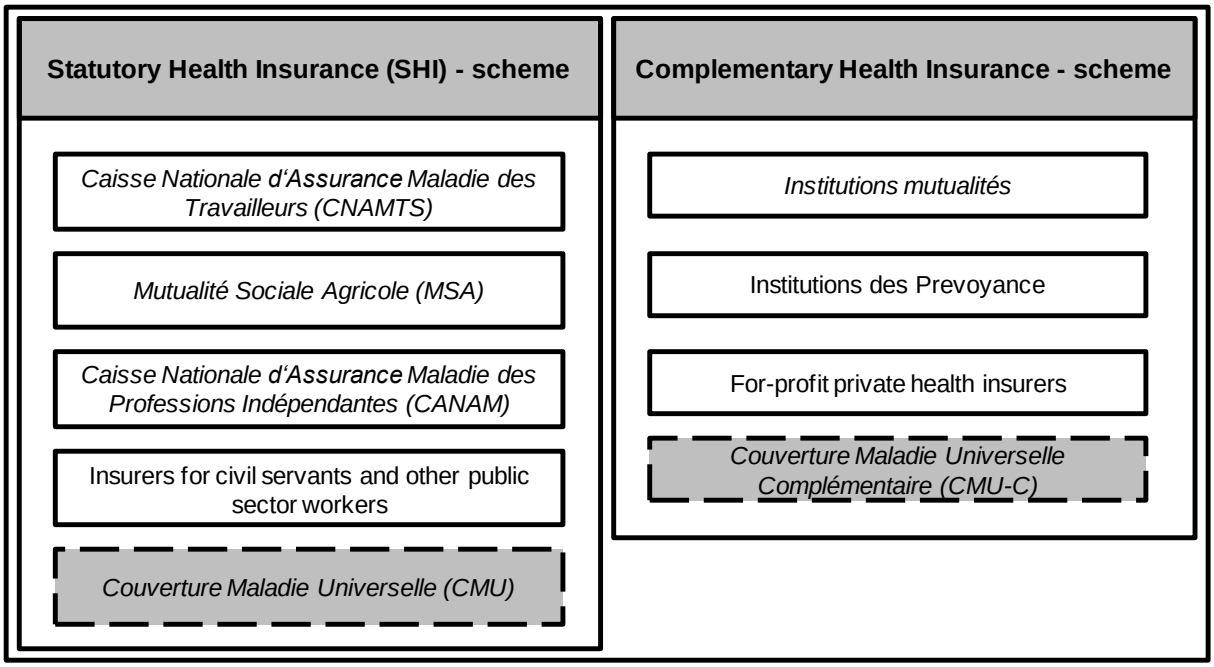
Although France has a comprehensive system of statutory coverage, there is a large market for private complementary health insurers. These private health insurers cover costs and co-payments not reimbursed by public insurers [Schölkopf 2010]. There are essentially three types of complementary health insurers:

- Non-profit, employment-based mutual associations (*Institutions mutualités* or *Mutuelles*)
- Provident institutions (*Institutions des Prevoyance*)
- For-profit private health insurers.

In addition, there are several social protection measures for the self-employed and liberal professions [Rothgang et al. 2005]. Since 2000, residents covered by the CMU have been entitled to complementary insurance coverage by a specific type of complementary health insurance, the *Couverture Maladie Universelle Complémentaire* (CMU-C). This form of insurance is also available for other low-income groups, even those who are covered by the general SHI-scheme [Kaufmann 2006]. In 2007, 92.8 % of the population had complementary health insurance [Schölkopf 2010; Garnero, Rattier 2009].

The following figure shows a summary of the French health insurance scheme:

Figure 3: The French health insurance scheme



Source: Institute for Health Care Management and Research

Funding

The funding of complementary health insurance is obtained from voluntary contributions that depend on the individual policy. Quite often, employers contract with private health insurers and offer convenient arrangements to their staff. In contrast, the SHI-scheme is funded by a number of different sources. Funding comes predominantly from the social insurance contributions of employers and employees. These contributions are determined by the Ministry of Health and Sports and account for 12.8 % of gross wages for employers and 0.75 % for employees. The collection of contributions is the responsibility of a national social security agency (*Unions de recouvrement des cotisations de sécurité sociale et d'allocations familiales*) [Beske et al. 2005]. Other sources of funding include a national income tax (*contribution sociale generalisée*), appropriated taxes, e.g., those levied on tobacco and alcohol, as well as state subsidies and transfers from other branches of social security [Durand-Zaleski 2009].

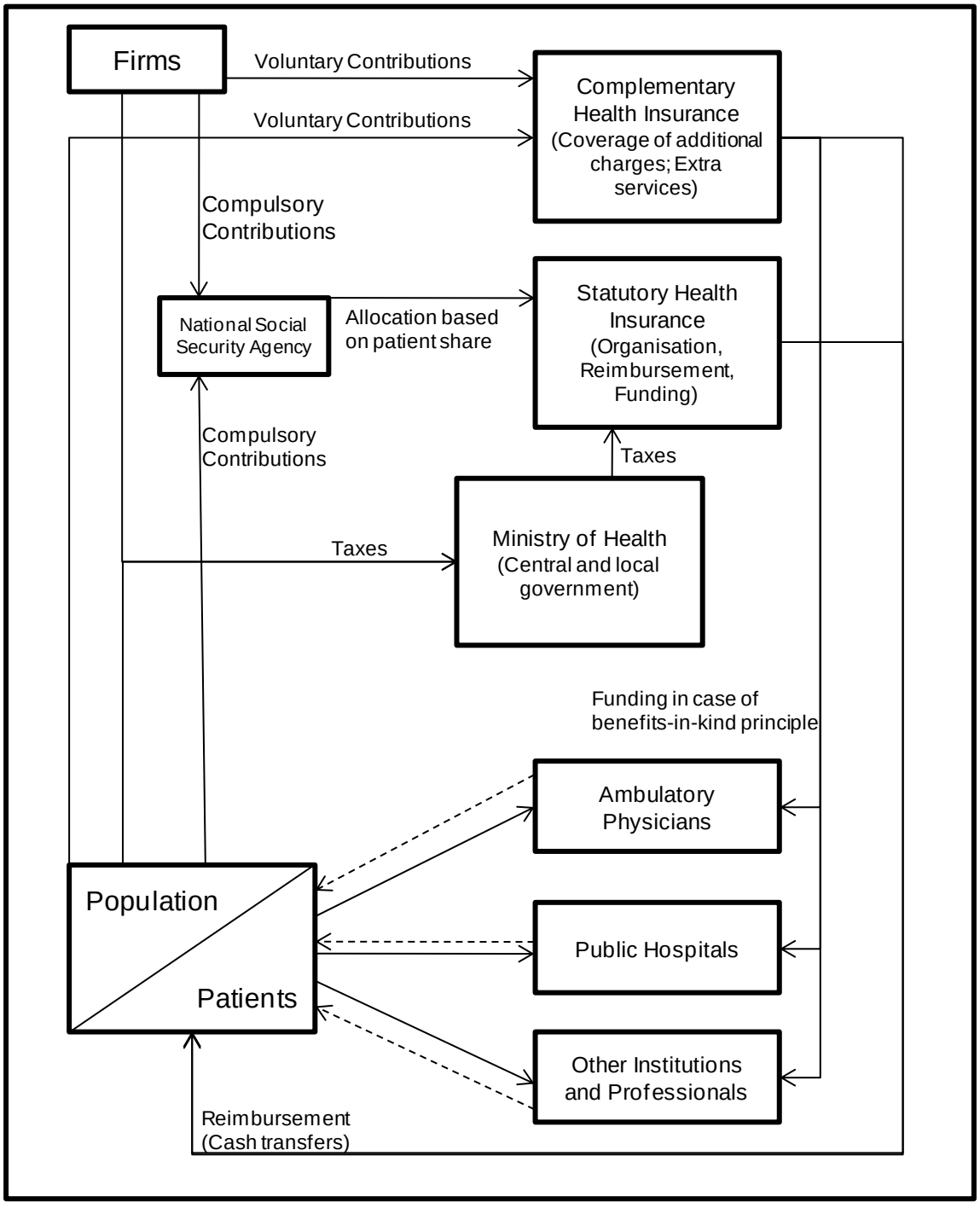
In addition to these mandatory contributions, cost-sharing plays an important role in funding the French health care system. Co-payments are levied for outpatient care (30 % of expenditures), hospital care (20 % plus a daily co-payment of 18 €) and dental care (30 %). Co-payments for prescription drugs vary between 0 % and 100 %, depending on the effectiveness of the pharmaceutical and health status of the patient [Beske et al. 2005; Schölkopf 2010]. These co-payments are mostly covered by complementary health insurance. In addition, there are non-reimbursable charges such as a 1 € fee for ambulatory consultations, 0.50 € per prescription drug and 0.50 € for paramedical services (e.g., services of orthophonists or orthoptists). Co-payments for drugs and paramedical services are limited to 50 € per year per person [Durand-Zaleski 2009].

Health benefits basket

The health benefits basket offered within the SHI-scheme is almost identical between different types of insurers. According to article L.321-1 CSS (*Code de la Securité Sociale*), it contains hospital care, ambulatory care and prescription drugs and, to a smaller degree, eye and dental care. Reimbursement of preventive services is restricted to certain target populations [Durand-Zaleski 2009]. The French system is typically based on a cost-reimbursement principle. The benefits-in-kind principle applies only to most inpatient services, to certain eligible populations and within parts of the complementary health insurance scheme, although it has become more and more significant in recent years [Schölkopf 2010].

The following figure gives a brief overview of the participants and the financial flow in the French health care system:

Figure 4: Participants and financial flows in the French health care system



Source: Institute for Health Care Management and Research based on Eco-Santé France [2011]

The total health care expenditures in France amounted to 223.1 billion € in 2009; this represents approximately 11 % of the gross domestic product and an expenditure of 3.450 € per person [IRDES 2010]. Overall, approximately 76 % of total health care expenditures are covered by the SHI-scheme, 14 % are covered by the complementary scheme and 9 % are

out-of-pocket payments [Fenina et al. 2010]. Expenses for eye care services account only for a small share of total health care expenses. The costs for ophthalmologic eye care services borne by the CNAMTS amounted to approximately 600 million € in 2009. In addition, CNAMTS covered approximately 45 million € for orthoptists' services and about 135 million € for optical appliances (corrective glasses and contact lenses) [Vaulont et al. 2008; CNAMTS 2009]. The organisation of eye care services in France will be described in detail in the next section.

3.1.1. Framework of eye care services

Eye care services in France are provided by three different categories of professionals: ophthalmologists[5], orthoptists and opticians. Although since the early 1980s it has been possible for French opticians to take university courses in optometry and there seems to be an increasing trend towards optometry in recent years, the optometric profession is not currently officially recognised in the French health care system. There have been recent legal initiatives regarding acknowledgement of the title "optometrist" (or *opticien-optométriste* in French), the latest in June 2010, but these have yielded no results so far [Panis 2010; Aboud 2009]. Thus, except for the few ophthalmic services that are performed by general practitioners, members of the three professions mentioned above are the main providers of primary eye care services in France.

The three professions and the respective titles associated with each are officially acknowledged by the state and regulated within the public health code (*Code de la Santé Publique - CSP*):

- Ophthalmologists (Art. 4111 – 4135 *Parte Legislative et Reglementaire du CSP)*
- Orthoptists (Art. 4342 – 4344 *Parte Legislative et Reglementaire du CSP*)
- Opticians (Art. 4362 *Parte Legislative et Reglementaire du CSP*)

Whereas ophthalmologists are recognised as medical professionals, orthoptists and opticians are regarded as paramedical or health care professionals. The public health code regulates and defines the rights and duties that pertain to professional practice in the French system. For example, the following areas are regulated: conditions for obtaining access to the profession (education, title, registrations, etc.), conditions of exercising as a professional, and

[5] Supported by doctors' assistants and other staff members.

measures of punishment in case of malpractice or misconduct. For orthoptists, the public health code even defines a detailed list of activities (*Décret de Compétence*) they are entitled to perform. In contrast, for opticians, such regulations are lacking, which leads to constant conflicts about their competencies and scope of practice (this area is discussed in further detail in chapter 3.1.3.2).

The ophthalmologist is the centre of primary eye care in France. The number of ophthalmologists currently practicing in the French metropolitan area, i.e. without overseas departments, is estimated by the French national medical council (*Conseil National de l'Ordre des Médecins*) to be 5,215 [Le Breton-Lerouvillois 2009] and by the Directorate for Research, Analysis, Evaluation and Statistics of Ministry of Health (DREES) to be 5,567 [Sicart 2009a].[6] These numbers constitute a proportion of less than 9 ophthalmologists per 100,000 population, with a high discrepancy between metropolitan and rural areas. Whereas in Paris there are about 26 ophthalmologists per 100,000 population, in Ardèche there are only about 3 professionals per 100,000 [Le Breton-Lerouvillois 2009]. Most of the French ophthalmologists (60.9 %) work independently in private practice [Le Breton-Lerouvillois 2009; Audo 2010]. In recent years, especially in urban areas, the traditional model of a single-ophthalmologist practice has been increasingly replaced by group practices of 3 or more ophthalmologists, principally for economic reasons. Group practices usually offer more space, better equipment and the opportunity to employ additional staff such as secretaries, accountants or nurses [Audo 2010]. Presently, almost one third of all ophthalmologists' office-based settings are group practices [Sicart 2009a]. In addition to the 60.9 % of ophthalmologists who are independent practitioners, another 13 % are employed by hospitals, private clinics or academic centres. The last quarter of physicians (26 %) work in mixed settings, typically offering clinical or surgical sessions in hospitals in addition to office-based activity [Le Breton-Lerouvillois 2009; Audo 2010]. The average age of ophthalmologists in France is around 52 years, with less than 500 physicians younger than 40 years [Sicart 2009a; Le Breton-Lerouvillois 2009].

Beside the ophthalmologists, two groups of paramedical professionals also provide eye care services in France to a noteworthy extent; these are the orthoptists and opticians. The orthoptist is an eye care professional who deals with the diagnosis and treatment of

[6] Data refers to the 1st January 2009.

defective eye movement and coordination, binocular vision and amblyopia. He or she is traditionally the direct assistant of an ophthalmologist and usually works under his supervision. Orthoptists are typically not allowed to practice without medical prescription and/or without the supervision of an ophthalmologist or another medical specialist. As direct access of the patient to orthoptic services is impossible, orthoptists provide primary eye care only in the broadest sense. A more detailed description of the education and scope of practice of orthoptists can be found in Appendix 3: Orthoptists in France. There will be no further detailed consideration of orthoptists in this study.

The third group of professionals who regularly participate in primary eye care in France are the opticians. French opticians are paramedical professionals and the official title is *Brevet de Technicien Supérieur d'Opticien-Lunetier* (BTS-OL). Currently, there are about 19,575 opticians in the French metropolitan area, corresponding to 32 opticians per 100,000 population [Sicart 2009b].[7] The number of opticians in France has doubled in the past ten years [HAS 2010]. Ninety-nine percent of opticians work in office-based premises; of these, 31 % are proprietors of an optician's premise, whereas the majority (68 %) have an employed occupation. Only five opticians are employed in the hospital sector [Sicart 2009b]. The number of opticians' stores in France has increased by 43 % since 1997. The latest statistics account for 10,520 opticians' stores, which are more or less homogeneously distributed throughout the country [HAS 2010; L'Opticien Lunetier 2010]. Almost half of all shops are under the umbrella of a larger company [Bour, Corre 2006; Acuité 2011a]. The optician usually does not practice alone in his store. The staff also comprises salesmen, assemblers and other opticians. On average, there are 2.5 workers per store, of whom 1.86 are BTS-OL [Acuité 2011a]. An optician is entitled to run more than one store, but each store must have a qualified optician on site; however, the optician in charge need not be the proprietor [Interview AOF 2010; Bour, Corre 2006].

Thus far, the French system has followed the principle of a strict separation of medical care from commercial sales. Ophthalmologists and orthoptists have typically provided ophthalmic care to the patient, while opticians are responsible for the provision of spectacles, contact lenses and other visual aids [Audo 2010]. In recent years, the separation between the three professions has become less strict, and more competencies have been shifted from

[7] Data refers to 1st January 2009.

ophthalmologists to the two other professions. As early as 2003, a comprehensive analysis was initiated to evaluate the consequences of delegating medical activities to adequately educated paramedical professionals. The results of this analysis showed that transfer of medical activities to non-medical professions is possible without a loss in the quality of eye care and there was even noticed an improvement in treatment duration [Berland, Bourgueil 2006]. With respect to primary eye care services, these tendencies are reflected by two recent significant changes in the Code de la Santé Publique regarding the scope of practice of orthoptists and opticians:

1) Since 2007, orthoptists have been permitted to determine the visual acuity of patients and to perform refractions, as well as to provide other services necessary for the examination and assessment of visual function and ocular pathology [Décret n°2007-1671 du novembre 2007].
2) French opticians were traditionally not entitled to use instruments to perform refractions. This regulation changed in 2007; currently, opticians are allowed to perform refractions for the renewal of corrective glasses within a period of less than three years since the initial medical prescription [Décret n°2007-553 du avril 2007]. This trend towards the performance of optometric services by opticians is also reflected by an emerging support of opticians' services by the complementary health insurance providers.

In summarising the framework of ophthalmic care in France, several essential aspects must be taken into consideration:

- Eye care services are primarily performed by members of three different professions (ophthalmologists, orthoptists and opticians); primary eye care services are mainly provided by ophthalmologists, with a significant contribution from opticians regarding the provision of optical aids.
- All three professions are officially recognised and regulated in the public health code.
- The demand for optometric services from opticians is increasing, although the title 'optometrist' has to date neither been secured nor officially acknowledged in the French system.
- In recent years, there has been a tendency to shift competencies from ophthalmologists' services to other professions.

3.1.2. Education of involved professionals

The education of each of the groups of primary eye care providers is distinct[8]. As in most other European countries, ophthalmologic education is based on a comprehensive and lengthy medical education with subsequent specialisation in ophthalmology. On the other hand, qualification for the optician's profession is based on a shorter and less comprehensive route of training. In the following chapters, the training of each profession will be described in detail. In addition to describing the basic training required for each specialty, a particular focus will be set on postgraduate training, especially for the opticians' profession, because of the recent trends towards optometry.

3.1.2.1. Ophthalmologists

Medical education in France, including education in ophthalmology, is divided into three parts (*cycles*) and requires about 11 years for an individual to graduate as a medical specialist. The first stage of education is the PCEM (*Première Cycle d'Études Médicales*), which lasts two years. The first year of the PCEM (PCEM1) is formally free to everyone who has successfully passed the *Baccalauréat* (the French equivalent to A-Levels in the UK and the German Abitur). It includes four different subjects and is primarily based on theoretical education [Ordre National des Médecins 2010a]. The number of students accepted into the second year of the medical education is defined yearly by the government, which sets a *Numerus Clausus* for the different education and research units [Sandier et al. 2004]; thus, the first year of studies concludes with a highly selective exam that typically grants access to the second year to only 15 % of all students [ANEMF 2010]. In the second year of education (PCEM2), students gain first-hand practical experience by assisting in hospital work and obtain more profound theoretical knowledge. Although the content of the PCEM is based on a nationally-accepted framework, there is a large variety between the universities in its configuration [Ordre National des Médecins 2010a].

The second stage of medical education (DCEM = *Deuxième Cycle d'Études Médicales*) starts with the third year of training and lasts about four years. During this time, students are

[8] From now on this chapter focuses on ophthalmologists and opticians. For more information about orthoptists see Appendix 3: Orthoptists in France.

required to pass a series of tests, attend seminars and complete defined periods of hospital internships in different specialties. In total, students must complete eleven predefined modules and pass an examination in the fourth year to receive the C*ertificate de Synthèse Clinique et Thérapeutique* [Ordre National des Médecins 2010a]. DCEM finishes with the *Épreuves Classantes Nationales*, the national classifying examinations, which allow students to indicate their preference for one of eleven specialties in the third stage of medical education (TCEM = *Troisième Cycle d'Études Médicales*). Depending on the rank achieved in the national examinations, students are permitted to choose the university hospital and the medical specialty they prefer.

To become an ophthalmologist, students must elect the surgical specialty. Residency lasts about 5 years. During this time, candidates perform full-time hospital work while spending six-month periods in different departments. Upon the successful completion of a doctoral thesis, candidates gain the DES (D*iploma d'Études Specialises*) and become ophthalmologists acknowledged by the National Council of the Medical Profession (*Le Conseil de l'Ordre des Médecins*) [De Pouvourville et al. 2003].

Although their education is typically surgical, ophthalmologists define themselves as "*medico-chirurgicales*" (medical surgeons) who are responsible for the surveillance, amelioration and maintenance of a healthy visual system and its annexes [Bour, Corre 2006].

At present, 41 universities in France offer medical studies; another four offer only the PCEM1 [Ordre National des Médecins 2010b]. The number of graduating ophthalmologists each year is approximately 80. In 2008 and 2009, 276 students registered for the DES in ophthalmology; these are likely to finish within the next 5 years. The number for 2008-2009 represents a slight increase over previous years (e.g., in 2006-2007 the number was about 230). According to Jean-Bernard Rottier, President of the French Association of Ophthalmologists, 2010, with 106 new ophthalmologists, yielded the highest number of graduates in the past 20 years [ONDPS 2009; Audo 2010; Gomes 2010].

Licensure as ophthalmologist

After an individual completes his or her medical studies, several formal aspects of establishment as a primary care ophthalmologist must be taken into account. The most important are:

- Registration with the regional Council of the Medical Profession (*Conseil Départemental de l'Ordre des Médecins*) according to article L.4161-5 CSP. If the requirements are met, the council endorses the candidate, adds his or her name to the list of medical practitioners (*Tableau de l'Ordre Médecins*) and provides an identification card for health care professionals (*Carte de Professionel de Santé*)
- Access to the Independent Pension Scheme Fund for French Physicians (*Caisse Autonome de Retraite des Médecins de France*)
- Becoming a member of the Family Allowance Fund (*Caisse d'Allocations Familiales*) at the point of practice
- Obtaining indemnity insurance (mandatory by law since 2002) and
- Registration with the SHI-scheme (see excursus on the next page)

  [Ordre National des Médecins 2010c; Profession médecin 2010a]

Excursus:

Agreements between independent ophthalmologists and the statutory health insurance programs

After completing his or her education, each ophthalmologist must register with the SHI-scheme. When registering, the ophthalmologist must indicate a sector of provision that he or she is willing to work in. There are three different sectors. Ophthalmologists practicing in the first sector commit themselves to apply the official charges for ophthalmologic services that are negotiated between the professional medical associations and the SHI-scheme (UNCAM). These ophthalmologists frequently benefit from reductions in the context of, e.g., social and pension contributions. Apart from a few exceptions, ophthalmologists practicing in the first sector are not allowed to exceed the negotiated rates. Ophthalmologists practicing in sector II are entitled to fix their own tariffs at a reasonable level above the national tariffs. Charges above the national tariffs are required to be paid out-of-pocket by the patient or by his complementary health insurance. In the third sector, designated "*non conventionnés"*, physicians are entirely free to set prices, but there is no reimbursement for the patient by the SHI-scheme [Sandier et al. 2004; Profession médecin 2010b]. The current distribution of ophthalmologists among the three sectors is shown in the following diagram:

Sector I	**Sector II**	***non conventionnés***
47.7 %	51.0 %	0.3 %

The number of ophthalmologists working in sector I is steadily decreasing. Since 2004, almost three out of four newly established ophthalmologists have chosen the second sector of provision, resulting in co-payments for patients or complementary health insurers [Aballea et al. 2007].

In addition to these formal aspects of establishing a practice, educated ophthalmologists must assure the licensing board that they meet the mandatory requirements of continuing medical education. According to the code of ethics for medical professionals, every physician is required to improve his skills and continue his education [Article R.4127-11 CSP]. This agreement, which was originally voluntary, became mandatory in 2003 for all medical practitioners [Décret n°2003-1077 du novembre 2003]. Each physician must accumulate a fixed number of points in a five-year period. To meet the requirements, he or she can choose from a large variety of courses in four categories:

1) Educational events
2) Individual education and e-learning

3) Personal practice
4) *Evaluation des Pratiques Professionnelles*

The fourth category, which was implemented in 2004, is the most recent. Compared with the first three categories, it is less pedagogical and more focused on evaluation of disease and prescription management by the physician. The organisations responsible for overseeing continuing medical education in France, including the recognition of activities, the accreditation of providers and the development of guidelines, are the French National Authority for Health (*Haute Autorité de Santé - HAS*) and the CNFMC (*Conseils Nationaux de la Formation Médicale Continue*) [Garrattini et al. 2010].

3.1.2.2. Opticians

Within the French system, a variety of professions, titles and certifications are associated with the opticians' market, albeit according to article L.4362-2 CSP, the *Brevet de Technician Supérieur d'Opticien-Lunetier* (BTS-OL) is the only recognised title that permits an individual to practice as optician and run an optician's store.[9]

In France, training to become an optician (BTS-OL) requires two years of full-time education or two years of part-time education combined with an apprenticeship. Optician training is authorised and organised by the Ministry of Education (*Ministère de l'Éducation*) and takes place in schools of secondary education (*lycée*) or in private schools [Interview AOF 2010; Portail des Métiers de la Santé et du Social 2010]. Thus, a combination of private and public spending is used to finance the education of opticians. The training route comprises, inter alia, theoretical and practical knowledge of the physiology of the eye and visual system, geometric and physical optics and techniques of fitting glasses. Communication and commercial skills are taught as well. At the end of the first year of education, students are required to complete a six-month internship. After an individual has successfully met all requirements, a final exam consisting of six written and verbal examinations is given. Each year, approximately 2,100 graduates in more than 55 institutions complete education in this field [De Pouvourville et al. 2003; Interview AOF 2010; Portail des Métiers de la Santé et du Social 2010]. Access to training to become an optician is granted to candidates who

[9] In addition, there is the possibility of recognition of other international training routes and titles to practice as an optician in France.

successfully pass their B*accalauréat (Bac)*. The general *Bac* is divided into different streams of studies; to become an optician, it is favourable to specify in sciences (*Bac S*), industrial sciences and technology (*Bac STI*) or laboratory sciences and technology (*Bac STL*) [Portail des Métiers de la Santé et du Social 2010]. Almost two-thirds of all students accepted to optician training have passed a *Bac S,* and another 13 % have obtained a *Bac STI* [Letudiant.fr 2010].

For pupils who have not passed the general Bac, there are other possible ways of obtaining the necessary qualifications to work in an optician's business. These include three types of studies organised by the Ministry of Education [Interview AOF 2010]:

- *Certificat d'Aptitude Professionnelle(CAP) Monteur en Optique Lunetterie*
- *Brevet d'Etudes Professionnelle (BEP) Optique Lunetterie*
- *Baccalauréat Professionnel (Bac Pro) Optique Lunetterie*

Typically, training for these studies starts at the age of 14 or 15 after the successful completion of the final year at college.[10] The training route for the BEP requires two years of full- or part-time education. The CAP is designed as a combination of training courses and an apprenticeship. Courses take place at professional *lycées* or in education centres. While the CAP merely leads to qualifications in the fitting of glasses, the BEP enables the holder to become an assembler and salesman of optical appliances [Interview AOF 2010; N.N. 2008; Syndicat des Opticiens sous Enseignes 2005].[11] The Bac Pro, for which the first exams will be held in 2012, was introduced in 2010. Candidates for the Bac Pro must pass three years of apprenticeship after the final year at college. This enables rapid access to the profession without the necessity of obtaining the general Bac and permits individuals to complete the BTS-OL afterwards [Institut et Centre d'Optométrie 2010; Ministère Éducation Nationale Jeunesse Vie Associative 2010; Arrêté du 8 avril 2010].

[10] The initial four years of secondary education following primary school are taught at the *collège*. After completion of this level, pupils vote for their further secondary education, for example by choosing between the general *baccalauréat* or the BEP, which is taught at the *lycée*.

[11] Both training routes will end in 2011 and will be substituted by a reorganised BEP "*Optique lunetterie*" starting in 2012 [Arrêté du 21 juin 2010].

Postgraduate training

Postgraduate training for opticians has undergone many changes within the last 20 years. Since the early 1980s, a trend towards optometry has occurred within the opticians' profession. However, despite the fact that there are a large variety of possible training routes through which opticians can continue their education after the BTS-OL, some of which also provide optometric knowledge, it must still be considered that the optometric profession is not quite recognised in the French health care system today and that the title "Optometrist (*optician-optométriste)*" is awarded only unofficially. The following table shows a brief overview of the different postgraduate training programs for opticians in France.

Table 4: Postgraduate training routes of French opticians

Name	Institution	Number of instituions	Access requirements	Length of studies	Graduation	Number of graduations per year
Certificat de qualification professionelle (CQP)	Professional colleges Private schools	10	BTS-OL	1 year	CQP Opticien responsable commercial de magasin d'optique CQP Opticien responsable technique de magasin d'optique	~25 ~45
Licence d'Optique Professionelle (Licence-Pro)	University	6	BTS-OL Other Bac+2[1] training route (e.g. two years medical training)	1 year	Licence d'Optique Professionelle	~120
Master "Biologie Santé", Spécialité "Sciences de la Vision"[2]	University	1	Licence d'Optique Professionelle	2 years	Master "Biologie Santé", Spécialité "Sciences de la Vision"	~30
Diplôme d'Université (DU)[2]	University	1	BTS-OL	~200 hours of training for each diploma	DU Dépistage en Santé Oculaire DU Optique de Contact DU Optométrie DU Optométrie spécialisée DU Optométrie et Contactologie	~120
Unités d'Enseignements (UE)	Private institutions	6	BTS-OL	33 days of training for each UE	UE Réfraction - Vision Binoculaire[3] UE Contactologie[3] UE Dépistage en Santé Oculaire UE Biologie/Sciences de la Vision UE Basse Vision UE Optométrie fonctionelle	~40-50[4]

[1] The French education system builds on the Baccalauréat. For example: The BTS-OL is a two years training route after the Bac, so it is called Bac+2

[2] The master program and the DU are exclusively taught at the university of Orsay (Paris). Contents of the master program are divided into modules. The completion of clustered modules is awarded a DU and is also approachable for students not attending the entire master program.

[3] The completion of UE Réfraction - Vision Binoculaire and UE Contactologie is awarded a nationally acknowledged certification, the *Certification Responsable en Réfraction et Èquipement Optique*

[4] The number of graduations refers to those students who obtain the *Certification Responsable en Réfraction et Équipement Optique* . The accurate number of candidates who pass all modules was not available.

Source: Institute for Health Care Management and Research

In addition to the established routes of postgraduate training for opticians, the French Association of Optometrists (AOF) also offers French opticians with an optometric background the possibility of achieving an international certification (ISO 9001-2008). The certification is awarded for the strict observance of different quality-related criteria in four domains (education, equipment, documentation and continuing education)[12] [AOF 2011].

According to the AOF, the training routes permitting an individual to refer to himself or herself unofficially as an 'optometrist' in France are:

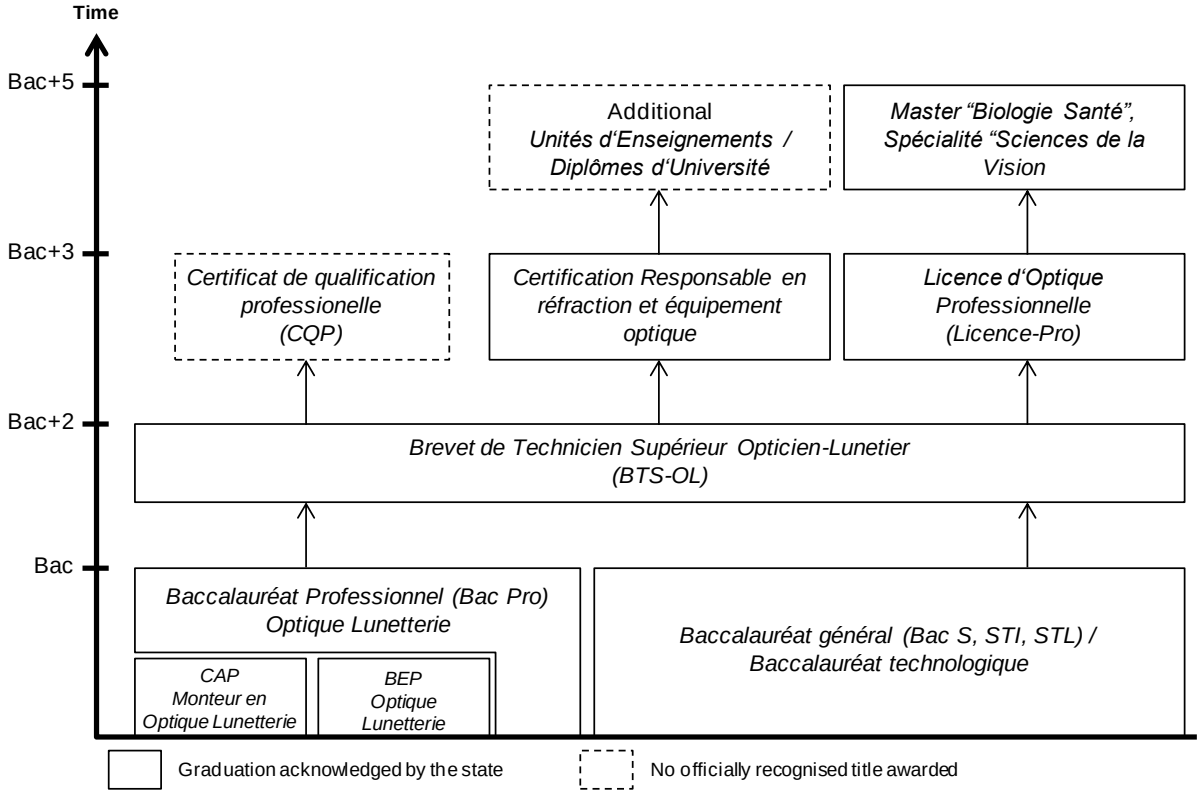
- A combination of university diplomas in optometry, contact lens optics and screening for ocular pathologies at Orsay;
- A combination of the *Unités d'Enseignements* in refraction, contact lens optics and screening for ocular pathologies at one of the private institutions;
- The *Certification Responsable en refraction et équipment optique (UE Réfraction – Vision Binoculaire + UE Contactologie)* plus the *Unité d'Enseignement* or a university diploma in screening for ocular pathologies;
- A master grade in vision sciences at Orsay;
- Successful completion of the European diploma in optometry (ECOO-Diploma)[13]. [Interview AOF 2010]

Because the optometric profession is not officially recognised in the French system, there are no official statistics on the number of optometrists practicing in France. Estimates range from about 2,000 to 3,000 optometrists currently established in France, with approximately 190 to 300 new optometrists joining the profession each year. More detailed and valid data is not available [De Pouvourville et al. 2003; AOF 2004a; AOF 2004b; Dufraisse 2005].

The following figure summarises the different possible routes by which an individual may become an optician/'optometrist' in France.

[12] Thus, it is an awarded certification but not a separate training route. For more detailed information see AOF [2011].
[13] The European Diploma in Optometry is the highest transnational acknowledged certification for opticians and optometrists in Europe. See more in Appendix 4: The European Diploma in Optometry.

Figure 5: Education scheme of French opticians



Source: Institute for Health Care Management and Research

Licensure as optician

After successful completion of his or her studies, an individual may be employed in an optician's store, or candidates who have at least passed their BTS-OL could obtain permission to run his or her own shop. In establishing a new shop, some formal requirements must be fulfilled. It is necessary for the proprietor of a new shop to register with the prefect of the department of the optician's residence [Article L.4362-1 CSP; Article R.4362-2 CSP]. Additionally, the optician must register with the following institutions:

- The regional administration of Sanitary and Social Actions (*Direction Départementale de l'Action Sanitaire et Sociale*)
- The commercial court (*Tribunal de Commerce*)
- The Regional Health Insurance Fund (*Caisse Régionale d'Assurance Maladie*), if the optician wants to be included into the national reimbursement scheme for glasses and contact lenses.

  [De Pouvourville et al. 2003]

Because the system is based on freedom of establishment, there are no regulations regarding the distribution of opticians in the French system [Interview AOF 2010; Bour, Corre 2006]. Recently, some legal initiatives to control the distribution of opticians throughout France were proposed; however, the outcome of the proposed initiatives remains to be seen [Acuité 2011b].

3.1.3. Scope of practice of involved professionals

Similar to the education of ophthalmologists and opticians, the scopes of practice of these two primary eye care providers are diverse. As the main providers of ophthalmic care, ophthalmologists have a comprehensive range of tasks, whereas, in conformity with their less extensive educations, opticians are much more restricted in their activities. The following chapters will take a closer look at these matters.

3.1.3.1. Ophthalmologists

The scope of practice of French ophthalmologists varies highly. Although their education is basically surgical, the majority of all ophthalmology professionals work in ambulatory (primary) care and thus perform a wide range of activities. Differences in the type of activities these physicians perform, depends on the competitive situation, point of service, individual preferences and economic considerations and the sector of provision of their practice (sector I or sector II, see excursus in chapter 3.1.2.1) [De Pouvourville et al. 2005]. Basically, there is a distinction between ophthalmologists who primarily perform surgeries and those who primarily provide nonsurgical services such as eye examinations and sight tests. The vast majority of ophthalmologists provide services in both settings, for example, running an independent practice and offering additional surgical sessions in hospitals or private clinics. Approximately 60 % of all ophthalmologists perform surgeries, mostly cataract, refractive, strabismus and eyelid surgeries. Laser surgery is also performed by the majority of ophthalmologists [Sahel 1998]. Thus, the range of these physicians' activities is widespread throughout ophthalmic care. Overall, the focus of most ophthalmologists' services is based on:

- Refractions
- Prescription of corrective glasses and contact lenses

- Comprehensive eye examinations
- Diagnosis and therapy of ocular diseases (e.g., glaucoma, age-related macular degeneration, cataract, diabetic retinopathy)
- Surgeries (with more than 400,000 interventions per year, cataract surgery is the most frequent surgical intervention in France [Brézin 2006])
- Emergencies
- Treatment of low vision and blindness
- Services of preventive health care

  [De Pouvourville et al. 2003]

Based on the traditionally strict separation of medical treatment and commercial products, French ophthalmologists are not permitted to sell optical appliances commercially. Apart from this, the French ophthalmologist offers the entire spectrum of ophthalmic care and is the most important primary eye care provider [Bour, Corre 2006; Spectaris 2010]. According to the statistics of Eco-Santé, in 2009, ophthalmologists in France performed more than 14 million consultations, another 14 million technical acts (see excursus); of these approximately 890,000 procedures were surgeries [Eco-Santé France 2011].

Excursus:

Consultations and technical acts

The French system distinguishes between consultations and technical acts. This differentiation is particularly relevant regarding aspects of remuneration. A consultation encompasses all services typically done in combination during a regular visit at the ophthalmologist (e.g., doctor-patient dialogue, refractions, examinations of the exterior and interior eye etc.). These services are remunerated at a fixed rate, normally between 25 and 33 € for an ophthalmologist practicing in sector I (see more in chapter 4.2.1). However, in contrast, for example, to the British sight test, there is no clear definition of the activities performed during a consultation. The extent of a consultation depends on the patient's needs and might range from a short dialogue to a comprehensive eye examination.

Technical acts are services beyond a consultation. These services encompass, for example, the fitting of contact lenses, an examination of binocular vision or a check of chromatic senses. These services are remunerated as fee-for-service and cannot be combined with a consultation fee.

3.1.3.2. Opticians

In France, an optician's scope of practice is wide. Although the profession is regulated in the public health code, there is no concrete and detailed regulative framework concerning its competencies. Basically, the optician is responsible for the sale and supply of optical appliances, especially glasses and contact lenses. As the only individual legally allowed to operate an optician's store, the optician has a monopoly on the sale of corrective glasses. According to article L.4362-9 CSP, the optician is not entitled to fit or sell corrective glasses to persons less than 16 years of age without the medical prescription of an ophthalmologist or another physician. By implication, this regulation does not prohibit the supply of corrective glasses to people aged 16 or older without medical prescription [HAS 2010]. However, a medical prescription is still required for reimbursement for corrective glasses inside the SHI-scheme.

Beginning in 2007, opticians were licensed for refractions in case of the renewal of a medical prescription that is not older than three years and as long as the prescribing physician does not prohibit the renewal. Under these circumstances, opticians can change the medical prescription, perform refractions and fit new corrective glasses; all of these activities were prohibited or at best tolerated before. The new regulation also allows reimbursement for corrective glasses by the SHI-scheme without medical prescription, whereas such reimbursement was formerly excluded [Décret n°2007-551 and 553 du 2007; Interview AOF 2010; AOF 2010]. Another resolution, which went into effect in April 2007, changed the 1962 regulations to permit opticians to use medical instruments necessary to test a person's sight (in other words, to perform refractions) [Arrêté du 13 avril 2007]. These regulations were established by article L.4362-10 CSP. Contact lenses are excluded from these regulations [Interview AOF 2010; Infolunettes 2010].

The fitting of contact lenses was originally considered a medical act; as such, it was performed almost exclusively by ophthalmologists. This opinion was officially confirmed in 1981 by the French court of cassation [Cour de Cassation du 17 février 1981]. Nine years later, however, the decision was abolished [Cour d'Appel Ordonnance de non-lieu du novembre 1990], and in 1998 the national consumer council expressed the opinion that fitting contact lenses is part of the scope of practice of opticians and not exclusively a

medical act. According to this argument, the safety of fitting contact lenses falls within the responsibility of the optician; thus, opticians, especially those qualified in optometry, are entitled to prescribe and fit contact lenses [AOF 2010; Interview AOF 2010]. However, even today, the point is controversial. Whereas the court of appeal manifested its opinion that the fitting of contact lenses is not an exclusive medical act by a decision in January 2011, the French Ministry of Health repeated its attitude towards the discussion only a few days later, stating that the fitting of contact lenses is as much a medical act as the diagnosis and treatment of ocular pathologies [Acuité 2011d; L'Opticien Lunetier 2011a]. Despite this ongoing controversy, the fitting of contact lenses by opticians is usually tolerated, although an initial consultation with an ophthalmologist is recommended, especially for an individual's first prescription. The sale of contact lenses is restricted to opticians and pharmacies, though only a few pharmacists do so [Infolunettes 2010]. Reimbursement for contact lenses by the SHI-scheme is only possible in cases where the lenses are delivered on medical prescription.

Officially, there is no legal regulation for opticians regarding eye examinations and screening for ocular pathologies. In the opinion of the Ministry of Health, examination of the eye is typically a medical act that should be left to ophthalmologists or other physicians. Due to the absence of concrete regulations, this topic is subject to a variety of interpretations. The Association of French Optometrists, supported by some complementary health insurers, takes the position that eye examinations are within the scope of practice of the optician, at least for opticians educated in optometry [AOF 2010; Interview AOF 2010]. Medical diagnosis and the performance of medical therapy are prohibited to all opticians.

Taking into account the factors mentioned above, it must be emphasised that, with respect to his basic education (BTS-OL) and officially regulated responsibilities, the French optician is a dispensing respectively a refracting optician[14] and not an optometrist. Opticians who are educated in and perform optometry still play a minor role in primary eye care. Despite the fact that some optometric activities are allowed or tolerated, the main focus of the optician's daily work remains the sale of optical appliances. One out of ten French adults wears contact lenses, and more than 35 million adults wear spectacles, which they renew approximately every three years. More than ten million spectacles and over five million

[14] Corresponding to category 2 of the WCO categories of optometric services (see Figure 1).

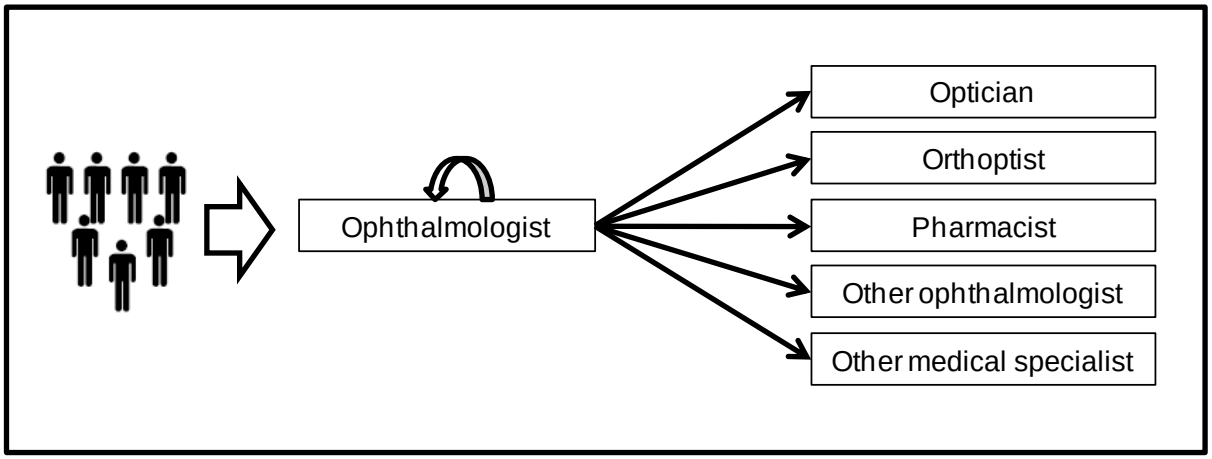
sunglasses have been sold in 2009, leading to a market volume of 5.2 billion € [Spectaris 2010; De Pouvourville et al. 2003].

3.1.4. Organisation of primary eye care

The ophthalmologist is typically the first contact person for patients suffering ocular problems. Patients may consult independent practitioners, ambulances or hospitals to obtain an ophthalmic consultation. Direct consultations in a hospital or with medical specialists other than an ophthalmologist (e.g., general practitioners) are rare and have tended to decrease in recent years, although in regions in which ophthalmologists work only in sector II of ambulatory care there may be a tendency toward increased hospital demand as patients avoid co-payments for sector II services [Bour, Corre 2006; De Pouvourville et al. 2003]. The ophthalmologist normally acts as the gatekeeper within ophthalmic care. He works closely with the orthoptist, who may perform additional examinations, including visual field tests or strabismus rehabilitation, and with the optician in cases where optical appliances are needed. Depending on the form of a patient's ocular pathology, the ophthalmologist may also direct the patient to other ophthalmologists (e.g., for surgery), to other medical specialists or to pharmacists [Audo 2010; De Pouvourville et al. 2003]. A small study[15] conducted by the French Association of Ophthalmologists shows that, in two thirds of all cases in which the patient is seen by an ophthalmologist, the patient is directed to a pharmacist (38 %) or to an optician (37 %) [Bour, Corre 2006]. The typical path of patients through primary eye care in France is shown in Figure 6:

[15] This study analysed the performances of ten ophthalmologists over a period of one week in 2005. About 2,000 patients were included in the study [Bour, Corre 2006].

Figure 6: Patients' pathway through primary eye care in France

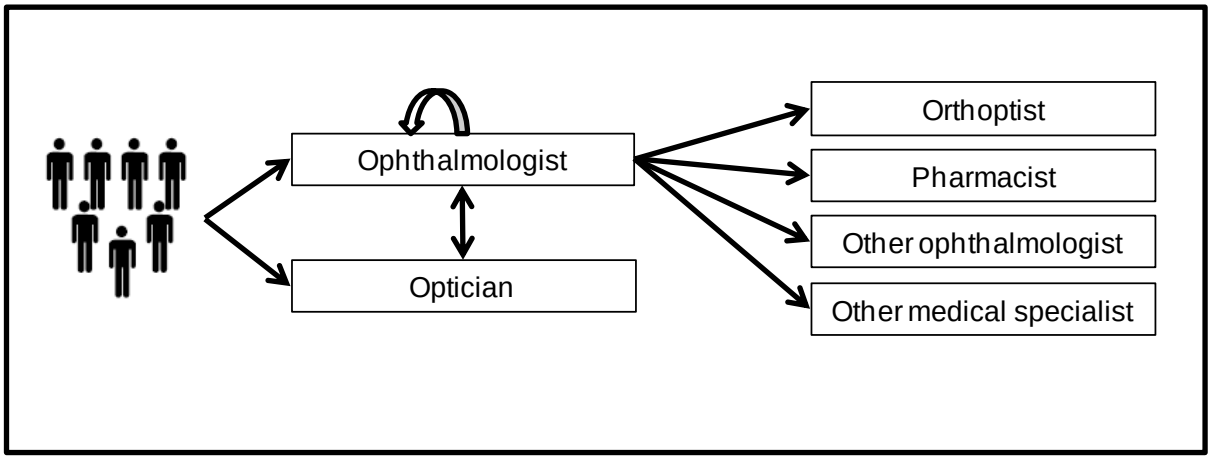


Source: Institute for Health Care Management and Research based on AOF [2004a]

An alternative pathway for primary eye care has been established in recent years (see Figure 7). In addition to first consult an ophthalmologist, patients can contact an optician directly. This primary eye care pathway has become more attractive in recent years, which might result from the existing regional shortages of ophthalmologists and the consequent long waiting times (up to 12 months) to get an appointment[16]. Other reasons for this trend might be a regional lack of ophthalmologists practicing in the first sector of provision, an increased occurrence of opticians trained in optometry or political changes that widen the scope of services provided by opticians[17].

[16] More detailed in chapter 4.1.4.
[17] See chapter 3.1.3.2; e.g., renewal of an ophthalmologic prescription for glasses by the optician.

Figure 7: Alternative pathway through primary eye care in France



Source: Institute for Health Care Management and Research based on AOF [2004a]

For children under 16 years of age with ophthalmic problems, consultation with an ophthalmologist (rather than an optician) is mandatory. The sale of glasses or contact lenses by an optician to children under 16 without a medical prescription is illegal [Article L.4362-9 CSP]. Although French adults have the option of directly consulting an optician, consultation with an ophthalmologist is more commonly chosen in cases of eye problems. Studies show that between 80 and 90 percent of all eye examinations are conducted by ophthalmologists; only a very small number (<5 %) are performed by opticians [Bour, Corre 2006; Spectaris 2010].

Patients are free to choose their ophthalmologists. The SHI-scheme covers about 70 % of the base rates for ophthalmologists' fees (see sample calculation below). The remaining charge is paid out-of-pocket or reimbursed by complementary health insurance [L'Assurance Maladie 2010a; Garnero, Rattier 2009]. While orthoptists' fees are reimbursed comparably to ophthalmologists' fees, eye examinations performed by opticians are not reimbursed at all within the SHI-scheme [De Pouvourville et al. 2005; Interview AOF 2010]; these costs are primarily paid out-of-pocket[18]. However, in recent years, some complementary health insurance programs have begun to assist with the cost of eye examinations performed by opticians [Interview AOF 2010].

[18] If the optician charges any costs at all. It is also possible, that eye examinations are offered for free and are cross-subsidised by the sale of optical appliances.

Table 5: Sample calculation of ophthalmologists' fees in France

Ophthalmologists practicing in:	Sector I (official nationwide charges)	Sector II (free price setting)
Consultation fee (example)[1]	25 €	40 €
Base rate	25 €	23 €
Reimbursement rate	70 %	70 %
Amount of reimbursement (minus 1 € non-reimbursable charge)	16.50 €	15.10 €
Remaining charge (incl. 1 € non-reimbursable charge)	8.50 €	24.90 €
[1] Several particularities affect the price. A more detailed description will be provided in chapter 4.2.1.		

Source: Institute for Health Care Management and Research

The SHI-scheme covers 65 % of the base rate for corrective glasses dispensed on medical prescription or according to the regulations concerning the renewal of corrective glasses [Article L.4362-10 CSP]. The base rate for a spectacle frame for adults[19] is 2.84 €, equivalent to a reimbursement of 1.85 €. The reimbursement rates for lenses depend on the patient's visual acuity. For the simplest lenses, the reimbursement rate is about 1.49 € [L'Assurance Maladie 2010b]. With respect to the average price for spectacles with single vision lenses, about 300 €, the reimbursement rates do not nearly cover the costs [Spectaris 2010].

In contrast to corrective glasses, contact lenses are reimbursed by the SHI-scheme only in cases where certain eye diseases exist. In these cases (e.g., irregular astigmatism or myopia of 8 or more dioptres) the SHI-scheme covers 65 % of a fixed rate of 39.48 €, thus 25.70 €, per eye and per year [L'Assurance Maladie 2010c]. The remaining costs must be paid out-of-pocket or by complementary health insurance. In total, the coverage of the SHI-scheme for optical appliances is about 5 % of the total costs [Autorité de la concurrence 2009; Vaulont et al. 2008]. At the beginning of 2011, SHI-coverage was reduced to 60 % of the base rate [L'Opticien Lunetier 2011b]. Consequently, complementary health insurance and out-of-pocket payments are very important in meeting the costs of optical appliances.

[19] Reimbursement rates for children considerably exceed the rates for adults, but also do not compensate the total costs.

The variety of different policies offered by complementary health insurance programs to cover parts of the remaining cost of optical appliances is wide. The differences in these policies depend on the type of insurer (*Mutuelles*, *Institutions des Prevoyance* and for-profit private health insurers) and on the type of the contract (individual or group tariffs). Typical policies offer reimbursement for optical appliances at a fixed rate per year or as a percentage of the base rate defined by the SHI-scheme. For example, an insurer may bear the cost of spectacles up to 100 € per year, or it may reimburse the recipient, for instance, 400 % of the SHI base rate for spectacle frames, which still only amounts to 11.36 € (2.84 € x (400 %) = 11.36 €). Combinations are possible as well. Some insurers do reimburse costs of optical appliances dispensed without medical prescription. Reimbursement for optical appliances by complementary health insurance thus is very important in France, but its benefit for the individual depends a great deal on the particular policy design [Mutuelle Santé 2010; Garnero, Rattier 2009].

In recent years, many complementary health insurers have attempted to control the patients' selection of eye care services in order to reduce costs. These health insurers established lists of opticians with whom they contract as "partners" and to whom they direct their insurees. In such cases, although the insuree might benefit from better reimbursement rates, he is limited in his choice of the optician. The opticians may gain an additional share of the market; however, they are usually restricted to lower prices for their optical appliances. These prices are determined by the complementary health insurance program or negotiated between contract partners [Interview AOF 2010; French-Property 2010a].

3.1.5. Organisation of secondary eye care

Secondary eye care services, for example, the treatment of ocular diseases, providing emergency care and surgical intervention, are exclusively the responsibility of ophthalmologists. Services are provided in ophthalmologists' practices, if appropriately equipped, and in hospital settings. Every university hospital offers services in ophthalmology that include ophthalmic clinics, technical and surgical facilities and an area for hospitalisation. In most cases, each university hospital has only one ophthalmic department available, so the ophthalmologists' work includes medical as well as surgical services and the treatment of emergencies. In hospital settings other than university hospitals, there is great variation in

how services are offered, ranging from the availability of a few consultation hours per week in ophthalmology to the attendance of several full-time working ophthalmologists [De Pouvourville et al. 2003].

Traditionally, the collaboration of hospitals with independent ophthalmologists and private clinics in France is of great importance in ensuring the provision of services in secondary eye care. Independent prescribers are assigned to most public hospitals for consultations and surgical services.More than 70 % of surgical services are delivered in private clinics and hospitals. There are only a few office-based practices, mostly group practices, which offer laser treatment as well as photodynamic therapy or intravitreal injections [Audo 2010; De Pouvourville et al. 2003].

Secondary eye care services performed by independent practitioners are reimbursed in exactly the same manner as the primary eye care services described in the previous chapter. The reimbursement rate of the SHI-scheme amounts to 70 % of the determined base rates. Hospital services are reimbursed at 80 % on average, with exceptions that may depend on the type of service, the executing hospital and other factors. Several types of hospital charges are transferred to the patients as co-payments (e.g., a daily charge of 18 €). Complementary health insurance sometimes covers these costs [French-Property 2010b; Schölkopf 2010].

3.2. Germany

Germany has the archetypal social security system. The system of social insurance (health care, accident and pension insurance) was first established on a national level in 1883 by Bismarck. The German health care system today is characterised by a predominance of mandatory statutory health insurance (SHI), with various competing sickness funds and a private/public mix of providers [European Observatory on Health Systems and Policies 2004]. In addition to the SHI-scheme, which covers nearly 90 % of the population, there is a comprehensive private insurance scheme covering approximately 10 % of the population [Schölkopf 2010].

The organisation of the SHI-scheme is based on the principle of self-government. The Federal Government sets the general framework, which is basically stipulated in the fifth book of the German Social Security Code (SGB V), while the configuration of services is the responsibility of the Federal States and corporatist bodies of self-government. The Federal States govern the organisation and funding of the hospital sector, while the corporatist bodies of self-government – consisting of representatives of the health insurers on the one hand and the service providers on the other hand – conclude contracts for the realisation of the statutory benefits basket. These contracts encompass issues of remuneration, volume of services and quality specifications. The most important body of self-government is the Federal Joint Committee (*Gemeinsamer Bundesausschuss*), which is responsible for the determination of services included in the statutory benefits basket and thus, the entitlement to benefits for approximately 70 million people who are insured in the SHIscheme [Beske et al. 2005; Schölkopf 2010; BMG 2011a].

Health insurance coverage is mandatory for the German population. Since 2009, every resident requires insurance either in the SHI-scheme or in the private system. The assignment to the systems depends on previous insurance periods, revenues and/or occupation. Employees with annual revenues up to 49,500 € are compulsorily insured within the SHI-scheme [BMG 2011b]. Their dependents (non-earning spouses and children) are covered free of charge. While retirees, recipients of unemployment benefits and farmers are also subject to statutory health insurance coverage, civil servants and the self-employed are inherently excluded from the SHI-scheme and have to purchase private health insurance coverage[20]. Employees earning gross wages above 49,500 € are entitled either to purchase private health insurance coverage or to stay voluntarily in the statutory system [Busse 2009]. As of April 2011, more than 65 % of the SHI insurants were compulsory insured, and only approximately 7 % were insured voluntarily [BMG 2011a][21].

Funding

Currently (as at 1 January 2011) there are 156 competing statutory health insurance funds in the German market [GKV-Spitzenverband 2011]. These health insurers are autonomous,

[20] Self-employed might also purchase voluntary insurance in the SHI-scheme.
[21] The remainders are dependents (~26 %) and others.

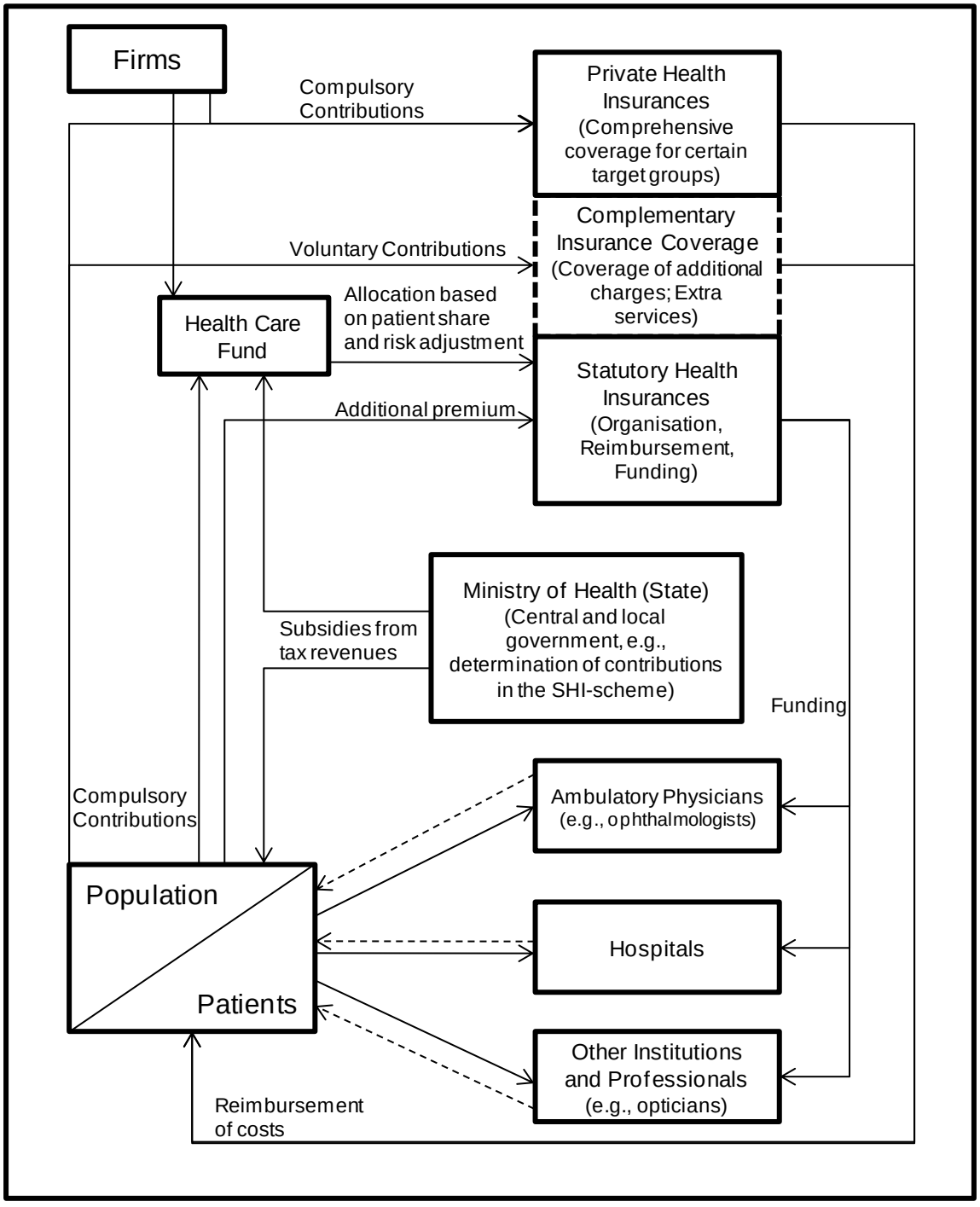
not-for-profit, non-governmental bodies regulated by law. Funding of the SHI-scheme is based on the principles of risk solidarity, income solidarity and application of the pay-as-you-go method. Revenues are primarily generated by mandatory income-related contributions levied as a percentage of annual gross wages up to 44,550 € or 3,712.50 € per month, which defines the maximum assessable income limit for social insurance contributions [Beske et al. 2005; Busse 2009; BMG 2011b]. Since 2009, contributions are fixed by the Federal Government for the entire SHI-scheme at a level of 15.5 % of gross wages. These contributions are paid nearly equally by employers (7.3 %) and employees (8.2 %). All contributions are pooled in a central health fund, from which resources are allocated to the insurers basing on risk-adjusted capitation fees, taking into account age, gender and morbidity from 80 different illnesses [Busse 2009]. If the allocations from the central health fund are not sufficient to cover the expenses of a single insurance fund, it has to charge an additional premium (*Zusatzbeitrag*) from its members. Starting in 2011, for people with low incomes, there will be social compensation of the additional premiums, which will be funded by means of taxation [BMG 2011b].

There have been several approaches to introduce cost-sharing patterns into the statutory system, which has traditionally imposed comparatively few co-payments. Co-payments are levied on (outpatient) pharmaceuticals, on dental care, on hospital and rehabilitation stays and, since 2004, for patients aged older than 18 years, on the first office visit per quarter or on subsequent visits without referrals for outpatient care. Cost-sharing is generally limited to 2 % of annual household income or to 1 % in exceptional circumstances, such as, the presence of a chronic disease [GBE-Bund 2011; Busse 2009].

The funding of private health insurances is completely different from the statutory system. Private insurers charge risk-adjusted contributions independent of the insurants' revenues [Schölkopf 2010]. Besides the offer of comprehensive insurance coverage for particular groups of interest, private health insurers also offer supplementary coverage for members of the SHI-scheme to enhance their benefits basket, for example, by covering co-payments for dental care or to improve accommodations in hospitals. There are 45 private insurance companies offering comprehensive or supplementary coverage for approximately 8.9 million comprehensive insurance clients and more than 21.9 million contractors of supplementary coverage [FAZ 2011]. 19 private insurers are non-profit, 26 are for-profit; there are,

however, hardly any differences between these two types of privat insurers. Private health insurances defray approximately 9.3 % of total health expenditures [GBE-Bund 2011]. The following figure summarises the financial flows in the general health care system:

Figure 8: Participants and financial flows in the German health care system



Source: Institute for Health Care Management and Research based on Busse, Riesberg [2004]

Health benefits basket

The benefits package for all statutory health insurances is defined in §11 SGB V. It is valid for the entire community of insurants, meaning that an individual deselection or co-optation of services is impossible[22]. The benefits basket of the SHI-scheme is commonly based on the benefits-in-kind principle, i.e., services are free at the point of delivery. The catalogue comprises certain preventive services, inpatient and outpatient hospital care, physician services, dental care, prescription drugs, remedies and medical aids, rehabilitation services, domestic services and sick leave compensation [Schölkopf 2010; Busse 2009]. The volume of benefits in the private health insurance scheme varies according to the particular contract. The private scheme is based on the cost-reimbursement principle, which implies payment in advance by the insurant and subsequent reimbursement by the insurer [Schölkopf 2010]. Services in the primary care sector are typically offered by independent, office-based practitioners, overwhelmingly working in individual practices, although the number of group practices is growing steadily. Secondary care services are primarily performed by hospitals administered by public, private, and charitable respectively religious associations.

Total health care expenditures in Germany amount to almost 278 billion € (in 2009), which corresponds to 11.6 % of the gross domestic product. With more than 58 % of total costs (approximately 161 billion €), the SHI-scheme bears the majority [Statistisches Bundesamt 2011]. The costs for eye care services amount to only a small part of the total costs. Approximately 700 million € were spent by the SHI-scheme for ophthalmologic primary care services in Germany in 2009 [Bewertungsausschuss Ärzte 2010]. Supplementing the estimated costs for outpatient surgeries, hospital services, private patients and eye care services paid directly by the patient (so-called *Individuelle Gesundheitsleistungen* – IGeL), the total amount of costs is approximately 2.6 billion € [Interview BVA 2011]. In addition, there is a market volume of more than 4 billion € for optical appliances, of which approximately 60 million € are financed by the SHI-scheme [ZVA 2010a]. This supposedly small part of health care services in Germany has faced significant changes over the last few years and is more frequently subject to political debates. The construction of German eye care services system will be analysed in more detail in the following sections.

[22] Exceptions are the offer of optional benefits such as *Satzungsleistungen or Wahltarife*.

3.2.1. Framework of eye care services

Primary eye care services are basically performed by ophthalmologists and opticians. In assistance there are participating orthoptists, doctors' assistants (*Arzthelfer*/in) and to a very small extent, general practitioners. There are approximately 2,000 orthoptists practicing in Germany [BOD 2011], although the German orthoptist is much less important to the organisation of primary eye care than his or her French colleague. Orthoptists work almost exclusively in secondary care settings or in ophthalmologists' practices, and patients have no direct access to these eye care providers. In contrast to the French system, where the orthoptist is the privelged aid of the ophthalmologist, in Germany this function is fulfilled by the doctor's assistant [Bour, Corre 2006]. However, both professions will be excluded from further research in this study.

Just as his French counterpart, the German ophthalmologist senses strong influence and enacts the main role in the provision of eye care services. Currently, there are 5,143 ophthalmologists performing primary eye care services, or 5,626 if employed ophthalmologists are included. In total, Germany registers 6,756 active ophthalmologists, including those working exclusively in secondary care settings [Kopetsch 2010; BÄK 2010]. That means there are approximately 8.3 ophthalmologists per 100,000 population considering all registered ophthalmologists and approximately 6.3 ophthalmologists per 100,000 population providing primary eye care[23]. In contrast to the French system, the distribution of ophthalmologists throughout the country is more uniform, with a minimum of 5.6 ophthalmologists per 100,000 population in Lower Saxony and a maximum of 8.6 in Bremen [Statistische Ämter des Bundes und der Länder 2011; Kopetsch 2010]. Office-based practitioners are distributed in approximately 3,600 doctor's offices, with the majority performing services as sole practitioners. The typical single ophthalmologist's office comprises, on average, five other employees, such as doctor's assistants or orthoptists. In addition, the introduction of a specific training route for ophthalmologic technical assistance was initiated in 2011 [Bertram, Schömann 2010]. According to the BVA (*Berufsverband der Augenärzte Deutschlands*), the representing body of German ophthalmologists, running an ophthalmologist's office with fewer than two assistants is almost impossible [Interview BVA 2011]. However, today, only one out of five practices is constructed as a group practice

[23] Without employed ophthalmologists.

[Statistisches Bundesamt 2009a], but similar to France, there is a recognisable trend in ophthalmic care in Germany towards group practices and ophthalmologists being employed in practices or in medical services centres (Medizinische Versorgungszentren) [Bertram 2010a]. The average age of German ophthalmologists is 51.2 years, with less than 17 % of them younger than 35 years old and almost 20 % are 60 years old or older [Kopetsch 2010]. The average age of German ophthalmologists is below the average age of all physicians, which is 52.1 years old [Interview BVA 2011].

Whereas the French system of primary eye care is characterised by an almost exclusive power of ophthalmologists and an only slowly appearing influence of opticians and "optometrists", the German system already senses a strong influence of opticians. Currently, there are approximately 48,800 people performing services in more than 10,000 opticians' premises [ZVA 2010a; ZDH 2010a].

Unlike in most parts of Europe, German opticians are craftsmen[24] and are not registered as heath care professionals. Ophthalmic optics ranks among the 41 professions listed in enclosure A of the German crafts code (*Handwerksordnung – HwO*) [Kluth 2008]. Due to the fact that German legislation considers ophthalmic optics to be a handicraft profession that could lead to dangers to the bodies and lives of third parties, there are high standards of education and a strict control of market access for opticians [Honig, Knörr 2008]. This allocation to the handicraft system leads to several essential requirements to practice as an optician in Germany; e.g., compulsory registration with the register of qualified craftsmen (*Handwerksrolle*) and thus, membership in the corresponding chamber of handicrafts (§1 HwO), a qualifying certificate as an *Augenoptikermeister*[25] (§§45 ff. HwO) or equivalent (§§7a-9 HwO) or the compulsory presence of an *Augenoptikermeister* in every optician's shop. The compulsory registration with the corresponding chamber of handicrafts (*Handwerkskammer – HwK*) reflects the organisation of craftsmen in Germany. Every optician running an optician's premise is a mandatory associate of the regional chamber of handicrafts, which is represented by the central chamber of handicrafts on the national level (*Zentralverband des deutschen Handwerks - ZDH)*. Overall responsibility is with the Federal Ministry of Economics

[24] They are also often announced as health trade professionals [Kluth 2010].
[25] The description and distinction of the different titles occurring in the optician's market will follow in chapter 3.2.2.2.

and Technology (*Bundesministerium für Wirtschaft und Technologie*), which is tasked, for instance, with determining the nationwide applicable crafts code or the training regulations for opticians. Regarding the range of competencies, there is – in contrast to health care professions such as psychotherapists – no professional law defined by legislation [Kluth 2008].

Concerning the range of activities performed by German opticians (more detailed in chapter 3.2.3.2), it is notable that they offer health services (such as subjective or objective refractions or screening for glaucoma) rather than pure handicraft services. However, the allocation to the handicrafts sector restricts the performance of medical activities, such as the diagnosis or treatment of eye diseases. Only the detection of eye health abnormalities is allowed (see excursus), without medical assessment. This restriction is the main reason for several attempts by the ZVA to release the opticians' profession from the handicraft sector and establish it as a health care profession. These tendencies are accompanied by initiatives to acknowledge the optometric profession officially in the German eye care system with an independent law for optometrists [ZVA 2009a; Workshop ECOO 2011]. Although the content of the training route to become an *Augenoptikermeister* would formally entitle graduates to refer to themselves as optometrists, based on a biomedical background that should at least formaly be part of their education, the title is neither officially acknowledged nor secured in the German system today[26] [Cagnolati 2011]. Nevertheless, there are indications towards the recognition of optometry as an official profession. As a first example, the complementary route of qualification as an "Optometrist (ZVA/HwK)", offered inter alia by the ZVA education academy in Knechtsteden, was acknowledged as an official training route per decree in the chambers of handicraft of Saxony and Brandenburg[27]. This training route offers for the first time the possibility for opticians to obtain a secured title as an optometrist and to document their higher qualifications and profile of competencies to their customers [Cagnolati 2011; Pawlowski 2010]. A more detailed description of the different training routes for opticians will follow in chapter 3.2.2.2.

[26] Exemptions are "optometrists" who obtained the title in the GDR before the German reunification.
[27] Further applications have been submitted to the chambers of handicraft in Düsseldorf, Munich and Brunswick-Lüneburg-Stade.

Excursus: *Screening judgement of the German Federal Constitutional Court*

That German opticians are entitled to detect abnormalities of the eye by performing screening tests, including tonometry, perimetry and examination of the interior and exterior of the eye, was subject to longstanding court disputes through all instances of German jurisdiction. In August 2000, the German Federal Constitutional Court finally decided that the measurement of intraocular pressure and the visual field test are part of the opticians' scope of practice, and that they are not violations of applicable medical law [BvR 254/99]. This decision was confirmed in two subsequent decisions of the German Federal Supreme Court in 2001 and 2005 [I ZR 197/00; I ZR 190/02]. This judgement was the most important decision for the ophthalmic optics branch in recent years, and it forms the basis for the future development of opticians and optometrists in Germany [Wetzel 2010].

The following summarises the framework of the eye care services provision in Germany:

- Eye care services are provided by ophthalmologists, opticians, orthoptists, medical assistants and, to a small extent, general practitioners.
- Primary eye care services are basically performed by ophthalmologists and, to a non negligible extent, by opticians, although opticians are classified within the handicraft sector and therefore, are not considered to be health care professionals.
- Overall responsibility for the optician's profession lies with the Federal Ministry of Economics and Technology and with the Federal Ministry of Health for the ophthalmologist's profession.
- "Optometrist" is not a secured title in the German system today, although opticians perform a substantial number of optometric services, and the first legal initiatives to acknowledge the optometric profession can be recognised.

3.2.2. Education of involved professionals

The education of the various eye care providers is, similar to the French system, characterised by a lengthy but comprehensive medical education for ophthalmologists that occurs in university units and by a large variety of training routes for opticians. The details will be provided in the following sections.

3.2.2.1. Ophthalmologists

The organisation of medical education in Germany is determined by the Medical Licensure Act (*Approbationsordnung*), which is set by ordinance of the Federal Ministry of Health with the consent of the Federal Assembly (Upper house of German Parliament) [§4 MBO-Ä]. Access to studies is restricted by a *numerus clausus*, which leads to the fact that only pupils who have passed the *Abitur* with superior grades qualify for medical studies. Basic education consists of six years of training at a university, including 48 weeks of continuous internship (*Praktisches Jahr*). Additionally, students have to complete an apprenticeship in first aid, three months of nursing and a four-month clinical traineeship (the *Famulatur*). The medical exam is divided into two parts: the first is administered after two years of education and the second at the end of the training route [§1 II, III ÄAppro].

Consequently, medical education is also divided into two different parts: a pre-clinical stage and a clinical stage. The pre-clinical stage imparts basic knowledge in several subjects, e.g., [§22 ÄAppro]:

- Physics and physiology
- Chemistry, biochemistry and molecular biology
- Biology and anatomy
- Basics of medical psychology and medical sociology.

The clinical stage encompasses training in general practices, anaesthesiology, ophthalmology, internal medicine, orthopaedics, surgery and others. Furthermore, students have to pass several cross-field disciplines, such as epidemiology, emergency medicine and palliative care [§27 ÄAppro]. After successfully completing the final examinations at the end of the training route, students are awarded their *Approbation,* which entitles them to practice medicine in Germany. Every completely educated physician becomes a mandatory member of the Medical Association (*Ärztekammer*). A doctor's title is not mandatorily required, although it might be advantageous in professional practice [Bundesagentur für Arbeit 2007].

Usually, comprehensive postgraduate training follows the initial medical training route to acquire more in-depth knowledge and skills for practicing medical services in particular medical specialties or subspecialties. To participate with the reimbursement scheme of the statutory health insurances, a completed postgraduate training as a medical specialist is

mandatory (§ 95a SGB V) [Bundesagentur für Arbeit 2007]. Postgraduate training respectively and residency is regulated within the *Weiterbildungsordnungen* of the Regional Medical Associations (*Landesärztekammern*) and is based on a model curriculum determined by the German Medical Association (*Bundesärztekammer*) [Kluth 2008]. Education takes 60 months in qualified settings, of which up to 36 months might be passed in primary care settings. During residency, physicians work as salaried employees on full-time contracts under the supervision of empowered physicians. Graduation is earned by passing a final exam, which leads to the title of a specialist physician in ophthalmology, or an ophthalmologist, as such a person is usually called. The contents of the exam include the consolidation of knowledge in prevention, diagnosis, therapy, aftercare and rehabilitation of anatomical and functional changes of the eye and its adnexa, including optometry and plastic and reconstructive surgeries inside the periorbital area [Section B 5. Augenheilkunde MWBO].

Licensure as an ophthalmologist

Besides a licence to practice medicine (*Approbation*) and a completed postgraduate training route in ophthalmology, registration with the Association of Statutory Health Insurance Physicians (*Kassenärztliche Vereinigung* – KV) and approval granted by the KV are necessary to access the SHI remuneration and reimbursement scheme for primary eye care services. The approval to become an SHI-authorised ophthalmologist depends on the fulfilment of all formal requirements and on the specific market situation in the area of the doctor's residence. The decision to grant approval is made by an accreditation committee with representatives of the statutory health insurers on the one hand and the medical profession on the other hand [§3; 19 Ärzte-ZV].[28]

For all SHI-authorised ophthalmologists, there is an obligation to maintain a high level of medical quality, to improve medical skills and to ensure safe patient care through continuing medical education. Two regulations require German ophthalmologists to pursue continuing medical education. The first is self-commitment as a medical professional to be up-to-date

[28] Without approval, ophthalmologists can work in primary care settings only on private invoices or as employees in primary and secondary care settings. Moreover, for these work patterns a postgraduate is not mandatorily required.

with current medical advancements [§4 MBO-Ä]. The second, established in 2004, is the obligation of §95d SGB V that every ophthalmologist must be able to prove to his or her KV that the requirements of continuing medical education have been met within a period of 5 years. To provide evidence, ophthalmologists have to obtain a certain number of points in various forms of training, e.g., media-based self-studies, participation in advanced training, clinical advanced training or other advanced training (e.g., further postgraduate studies). If an ophthalmologist fails to achieve the determined number of points, the KV can inflict a financial punishment, normally in the form of a deduction in SHI-remuneration [§95d III SGB V].

Summarising ophthalmologic education in Germany, these five essential stages must be fulfilled to practice as primary eye care provider:

1) Initial medical education of six years culminating in the *Approbation*
2) Postgraduate training and specialisation in ophthalmology
3) Registration with the Medical Association
4) Registration with the Association of Statutory Health Insurance Physicians and approval for settlement as an office-based ophthalmologist
5) Fulfilment of requirements for continuing medical education.

Currently, there are 36 universities offering courses in medical education, including a single private institution in Witten-Herdecke. The total number of students was approximately 76,000 in 2008, and the number of graduations was a little less than 10,000 [Kopetsch 2010]. Every year, 200 to 240 ophthalmologists finish their postgraduate training [Interview BVA 2011; Kopetsch 2010].

3.2.2.2. Opticians

The responsibility for the education of opticians in Germany lies with the Federal Ministry of Economics and Technology, in agreement with the Federal Ministry of Education and Research [§25 HwO]. Two different training routes have been established: an initial training route to become an *Augenoptikergeselle* (corresponding to a dispensing optician) and a successive training route to become an *Augenoptikermeister* or an equivalent title (corresponding to a refractive/ophthalmic optician or optometrist).

The training route to become *Augenoptikergeselle* takes three years of full-time education, during which students gain basic skills in economics, communication, the manufacturing of corrective glasses and the assessment of the features and effects of optical appliances [§3 AugOptAusbV].[29] There are no official entry requirements to start one's education. However, most premises recruit journeymen possessing at least an intermediate education certificate (*mittlerer* Bildungsabschluss) or even an advanced technical college certificate (*Fachhochschulreife*) [Bundesagentur für Arbeit 2011a]. Lessons are taught simultaneously at the vocational school, in an optician's premise and as appropriate, in external settings. There are approximately 30 vocational schools and approximately 3,500 opticians' premises educating *Augenoptikergesellen* in Germany. On average, approximately 6,000 *Augenoptikergesellen* are engaged in all stages of education, and each year 1,400 to 2,000 *Augenoptikergesellen* graduate (1,558 students completed examinations in 2009) [ZDH 2010b; Interview ZVA 2011b]. The certificate as an *Augenoptikergeselle* entitles one to work as an employed optician but not to operate an optician's shop. For this, enrolment in the register of qualified craftsmen is necessary, which requires a higher education [§1 HwO]. Approximately 50 % of all graduates pursue a higher qualification after finishing the initial training route [Interview ZVA 2011a]. Currently, there are three ways of entering the register depending on one's former education. These training routes will be described in more detail in the following sections.

- *Augenoptikermeister:*

The traditional pathway to entering the opticians' market is by becoming an *Augenoptikermeister*. The *Augenoptikermeister* is typically characterised by three core competencies. He or she is a specialist for opticians' services, a businessperson and an instructor of apprentices[30] (*Augenoptikergesellen*). Basically, the "*Meister*" is not a training route but an awarded title after the successful completion of the *Augenoptikermeister* examination. Because of the complexity of the exam, many institutions offer courses to prepare for the final exam, normally as part-time courses.[31] Typically, courses are offered over a period of 12 to 30 months [Kluth 2008].

[29] Facing the shift of activities from manufacturing to service provision, a new edited education order - imparting aspects of physiology and optometry - was recently developed and will be implemented probably in autumn 2011 [Friedrich 2010].
[30] After successful completion of a trainer aptitude examination (*Ausbildereignungsprüfung*).
[31] Other constellations, such as full-time education or block instruction, are also possible.

The content of studies is oriented towards the regulations for the *Augenoptikermeister* examination (*Augenoptikermeisterverordnung*) and comprises theoretical and practical knowledge and experience in the fitting of spectacles and contact lenses, objective and subjective refractions and the determination and assessment of vision defects and abnormalities [§2 AugOptMstrV]. In addition, more detailed knowledge in economical, commercial, communicative and pedagogical subjects is provided. Besides a completed education as an *Augenoptikergeselle* and possibly some years of practical experience, there are no other entry requirements. Courses are offered in various settings, including the ZVA education academy in Knechtsteden and the education centre of the optician's guild of Hanover in Hankensbüttel as well as other public and private institutions. In total, there are nine institutions offering these courses [Lerch 2011; Interview ZVA 2011a].

Although the *Augenoptikermeister* is the traditional way to finish postgraduate training in the optician's branch, there are other titles and training routes that lead to the same competencies and also entitle the graduate to be inscribed in the register of qualified craftsmen and thus operate an optician's premise. The recognition of other titles is based on §7 HwO. The most important certifications that are covered by this regulation are the "*Staatlich geprüfter Augenoptiker*" and the "*Bachelor of Science Augenoptik/Optometrie (FH)*" curricula taught at universities of applied sciences.

- *Staatlich geprüfter Augenoptiker:*

Courses to become "*Staatlich geprüfter Augenoptiker*" are offered at special colleges (*Fachschulen*) for those *Augenoptikergesellen* who hold at least an intermediate education certificate (*Mittlerer Bildungsabschluss*). Usually one additional year of practical experience is required to access this education, although since the redesign of the crafts code in 2004, it is no longer mandatory [§49 HwO]. Four institutions in Cologne, Munich, Jena and Diez offer these courses. The length of studies is usually two years, which culminates with a final exam set by the state and the *Augenoptikermeister* examination. Theoretically, the title "*Staatlich geprüfter Augenoptiker*" is of superior quality than the traditional *Augenoptikermeister*, because the education is based on a controlled training route with regular performance measurements [Interview VDCO 2011]. Due to a large variety in the configuration of training routes for both certifications, the practical relevance of these differences is almost negligible [Interview ZVA 2011a; Interview ZVA 2011b].

- *Bachelor of Science Augenoptik/Optometrie (FH):*

The highest qualitative standard in the basic education of opticians in Germany is set in training routes to become "*Bachelor of Science Augenoptik/Optometrie*" offered at universities of applied sciences (*Fachhochschulen – FH*). Currently there are six universities of applied sciences offering curricula for bachelor's students in ophthalmic optics. These are:

- University of Applied Sciences Lübeck
- Beuth University of Applied Sciences Berlin
- University of Applied Sciences Ostfalia
- University of Applied Sciences Jena (also in cooperation with the ZVA Academy Knechtsteden)
- University of Applied Sciences Aalen
- University of Applied Sciences Munich

The bachelor's program normally takes 6-7 semesters, including a one-semester internship. The contents are oriented towards the challenges of the *Augenoptikermeister* examination, the curricula of British optometrists and the ECOO diploma – thus including more subjects in ophthalmic optics and optometry [Kluth 2008; ZVA 2011a]. This high level of education requires higher entrance qualifications in the form of an advanced technical college certificate or a high-school diploma (Abitur), besides the completed apprenticeship as an *Augenoptikergeselle*. Only the ZVA-Academy in Knechtsteden offers a bachelor's degree for students not holding an adequate school certification [Lerch 2011]. The bachelor's program entitles graduates to be inscribed in the register of qualified craftsmen and to register with the chamber of handicrafts, and therefore, it leads to the same rights that *Augenoptikermeister* [ZVA 2011a]. Between 500 and 600 examinations to become an *Augenoptikermeister* are passed annually (531 in 2009) [ZDH 2010c]. The number of bachelor's program graduates and graduates of the *Fachschulen* is estimated to be approximately 400 per year [Dietze 2010].[32]

Theoretically, all three training routes should comprise biomedical and optometric components and should consequently enable graduates to refer to themselves as optometrists[33]. Analysis of the different curricula in detail demonstrates a problem of

[32] Duplications with the number of *Augenoptikermeister* might be possible, because the *Augenoptikermeister* examinations might be also offered as part of the curriculum at the *Fachschulen* and universities of applied sciences.

[33] Aside the fact that the title is not secured in the German system.

German ophthalmic optics/optometry. There is great variety in the depth and extent of the professional training, and the requirements of the *Augenoptikermeisterverordnung* are frequently met in an insufficient manner. Even the bachelor's degrees from the universities of applied sciences do not ensure adequate biomedical and optometric training. Due to these limitations in education, there are basically three different types of opticians in Germany [Cagnolati 2011]:

- *Augenoptikergeselle* = dispensing optician;
- *Augenoptikermeister* (or the equivalent degrees) without a biomedical education = refracting optician;
- *Augenoptikermeister* (or the equivalent degrees) with a biomedical education = optometrist.

Postgraduate training

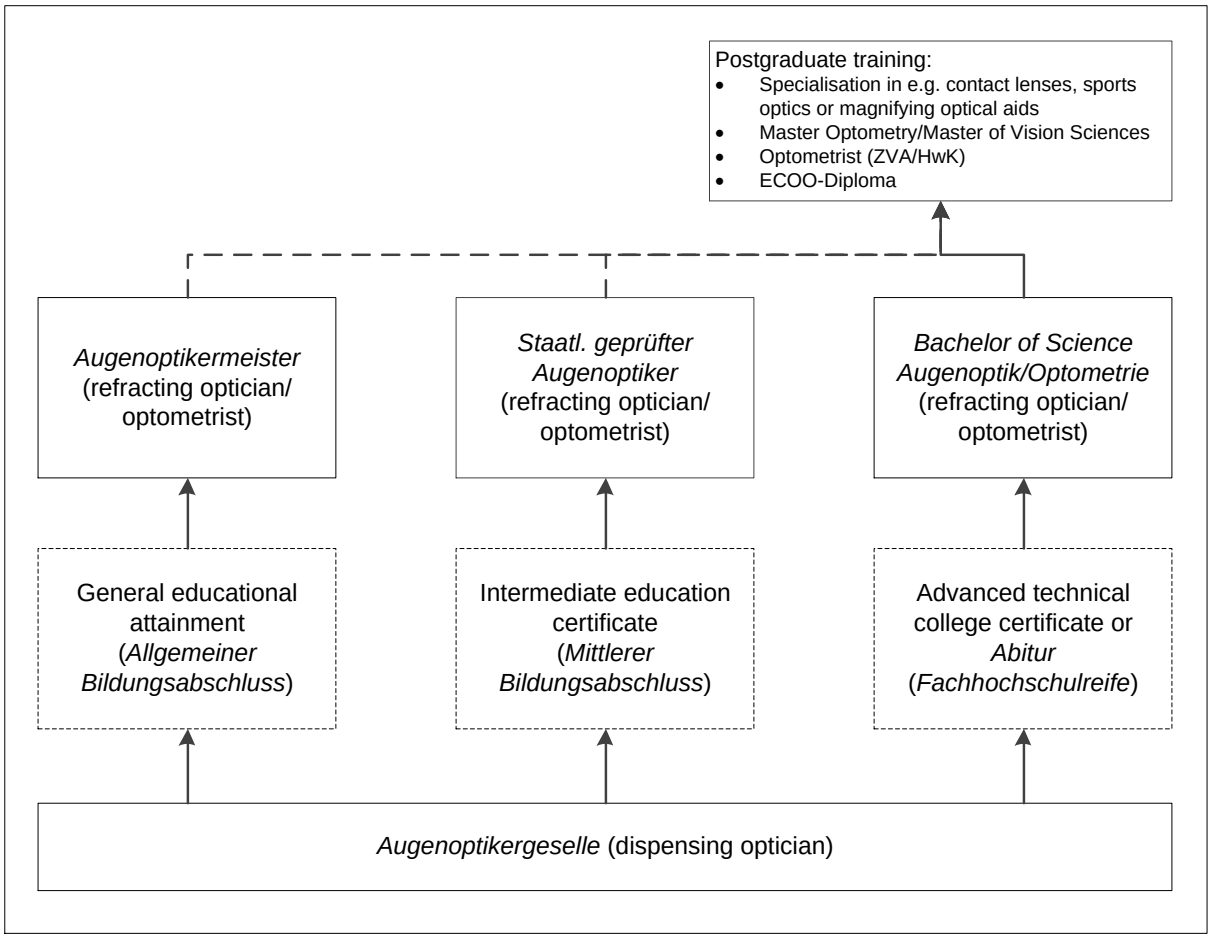
There are various possibilities for the postgraduate training of opticians in Germany, which leads to a specialisation in optometry.

- The aforementioned "Optometrist (ZVA/HwK)" is a postgraduate training route based on a previous degree as an *Augenoptikermeister* (or equivalent) and at least two years of practical experience. Those contents extend considerably beyond the contents of the *Augenoptikermeister* examinations and focus on subjects such as anatomy and physiology of the eye, optometric screening measures, slit lamp examination and ophthalmoscopy. Thus, a more intense biomedical training is delivered to the students, and the requirements to practice as an optometrist, also in the sense of the European and World Councils of Optometry, are met [ZVA-Bildungszentrum 2011].
- Based on an earlier bachelor's degree, the universities of applied sciences in Aalen, Jena and Berlin offer master's degrees in optometry or vision sciences. The master's program usually takes three semesters of part-time education. The universities in Berlin and Aalen offer courses in cooperation with colleges and universities in the USA leveraging education quality to a higher and more practical level [Lerch 2011].
- For candidates not holding a school certification or a bachelor's degree, there is the possibility of advanced training and specialisation, e.g., in sports optics, contact lenses

and low vision, by attending seminars and courses offered by the ZVA [ZVA 2009b; Interview VDCO 2011].

The following figure summarises the training routes for German opticians:

Figure 9: Education schemes for German opticians



Source: Institute for Health Care Management and Research

Although the German system shows considerable heterogeneity in the configuration of training routes after the initial training as an *Augenoptikergeselle* (dispensing optician), and thus a uniform characterisation of *Augenoptikermeister, staatlich geprüftem Augenoptiker* and *bachelor's degree graduates* as "optometrists" does not perfectly reflect the German situation of opticians and optometrists, in the subsequent parts of this study, the English terminology will be used. This is a result of four arguments:

1) Formally, every *Augenoptikermeister, staatlich geprüfter Augenoptiker* and *bachelor's degree graduate* should have received an adequate biomedical education to be regarded as an optometrist.
2) Regarding issues of regulative framework, scope of practice or the role of the provider in primary eye care there is no difference between *Augenoptikermeister, staatlich geprüfter Augenoptiker* and *bachelor's degree graduate*. All three have the same rights in the German system; thus, a differentiation is not necessary and moreover it is not possible. Not even the number of providers, who have received an adequate biomedical training is known.
3) As will be shown in chapter 3.2.3.2 the scope of practice of German *Augenoptikermeister and the equivalent graduations* correspond to category 3a of the WCO categories for optometric services (see Figure 1), thus a designation as optometrist is justifiable.
4) With regard to a three-country analysis, a uniform terminology simplifies the comparison.

Consequently in the following, the designation of a German optician will be as follows:

- **Dispensing optician** = *Augenoptikergeselle*
- **Optometrist** = *Augenoptikermeister* (or equivalent)
- **Opticians** = *Augenoptikergeselle* + *Augenoptikermeister* (or equivalent).

3.2.3. Scope of practice of involved professionals

The scope of practice of German ophthalmologists and opticians is very similar to their French counterparts. Ophthalmologists, based on their comprehensive medical education, form the centre of care and offer the entire range of ophthalmic services, while opticians traditionally focus on the sale of optical appliances. However, in the German system, the development of optometry is more advanced than in France and is reflected by greater competencies and a wider range of activities performed by German optometrists. The detailed scope of practice will be analysed in the following sections.

3.2.3.1. Ophthalmologists

The German ophthalmologist forms the centre of ophthalmic care and possesses comprehensive knowledge about all aspects of primary and secondary eye care. The practical focus on eye care services is highly variable. There are ophthalmologists who almost exclusively provide primary eye care services, such as eye examinations, sight tests or diagnosis and assessment of ocular pathologies. There are also service providers who exclusively perform ophthalmic surgery and others who offer mixed services. The exact number of ophthalmologists performing surgeries is not ascertainable, because in Germany there is no official distinction between surgical and nonsurgical ophthalmologists. The professional association of surgical ophthalmologists (*Berufsverband Deutscher Ophthalmo Chirurgen*) estimates that the number of surgical ophthalmologists is between 900 and 1,000 professionals who perform surgeries to a significant extent in primary eye care settings (outpatient surgeries). An additional 200-300 perform surgeries in secondary eye care settings [Webersin 2011].

The range of activities of all ophthalmologists might encompass – in accordance with the education regulations to become a specialist in ophthalmology – services in prevention, diagnosis, therapy, aftercare and rehabilitation of the eye and its adnexa, including optometry and plastic and reconstructive surgeries inside the periorbital area [Section B 5. Augenheilkunde MWBO]. In detail, the services include the following:

- Subjective and objective refractions
- Ophthalmologic examinations, such as slit lamp examinations, ophthalmoscopy, tonometry, perimetry and the determination and assessment of contrast and chromatic senses
- Sonographic examinations
- Treatment of injuries to the eye and its adnexa
- Ophthalmic intervention on the eyelids and lachrymal sacs or the conjunctiva and cornea and
- Cataract and glaucoma surgeries

  [Kluth 2006; Bundesagentur für Arbeit 2011b].

Whereas the entire range of ophthalmic services may fall within the scope of practice of German ophthalmologists, commercial sales are restricted by law. As an example, the

German Federal Supreme Court prohibited in its decision of 24 June, 2010 [I ZR 182/08], the sale of corrective glasses by ophthalmologists, even in cooperation with opticians.[34]

On average, German ophthalmologists treat approximately 5,800 patients per year within the SHI remuneration and reimbursement scheme. This means that approximately 40 patients per day or five patients per hour, based on an eight-hour work day [Interview BVA 2011]. Private patients need to be added to this computation, but no detailed statistics were found.

3.2.3.2. Opticians

Regarding the scope of practice of opticians in Germany, there must be a clear distinction between dispensing opticians and optometrists. Dispensing opticians are primarily active in the sale and manufacture of optical appliances (spectacles, contact lenses and low vision aids) and in advising customers. Furthermore, they are allowed to perform the sight tests necessary for drivers' licenses [Kluth 2008]. Certain activities require the supervision of an educated optometrist, and there are also differences regarding the scope of practice of dispensing opticians, who have accessed one of the training routes for higher qualification [ZVA 2009b].

The optometrist is, in addition to the activities of dispensing opticians, entitled to perform objective and subjective refractions, the fitting of contact lenses and screening tests. He or she is capable of determining and assessing abnormalities of the visual system and to refer clients to an ophthalmologist in cases of discrepancies or evidence of ophthalmic diseases. In case of refractive errors, he or she is entitled to fit the client with the correct optical aid [Kluth 2008; ZVA 2009b].

A primary activity of German optometrists is the subjective and objective refraction of the eye. Since the refraction decisions of the Federal Supreme Court [I ZR 104/70], the Federal Administrative Court [IC 73/64] and the Federal Social Security Court [6 RKa 16/72], at the end of the 1960s and the beginning of the 1970s, refractions are officially acknowledged as services within the scope of practice of German optometrists.

[34] There might be some exemptions due to medical reasons, but not for commercial objectives.

Another broad field of activity is the fitting of contact lenses. Since the 1970s, the fitting of contact lenses has been confirmed as part of the optician's work [Interview VDCO 2011]. Due to the complexity of this activity and the consequently requested theoretical knowledge and practical experience it requires, only educated optometrists are permitted to fit contact lenses. The delegation of respective tasks to dispensing opticians or employees undergoing training is prohibited, although it might be tolerated in daily practice when a responsible optometrist supervises the work. The same standard applies to the individual fitting of low vision aids [ZVA 2009b].

Since the legal decision of the Federal Constitutional Court in 2000 (see excursus in chapter 3.2.1), opticians are also entitled to perform screening measures, for example, to detect suspected cases of glaucoma. Possible screening tests include the measurement of intraocular pressure (tonometry), the determination of the field of vision (perimetry), the examination of chromatic senses, and the evaluation of visual acuity or accommodation ability [ZVA 2009b]. Screening methods are not diagnostic procedures but are procedures to determine abnormalities. Thus, these methods are not exclusively performed by health care professionals but also by educated craftsmen [ZVA 2009b]. The final diagnosis of eye abnormalities rests only with the ophthalmologist. Consequently, opticians are obligated to inform the patient that only an ophthalmologist can definitively diagnose eye diseases [Schreiber 2008].

This obligation is accompanied by a self-commitment on the part of every optician performing screening measures to refer clients to the ophthalmologist in cases of:

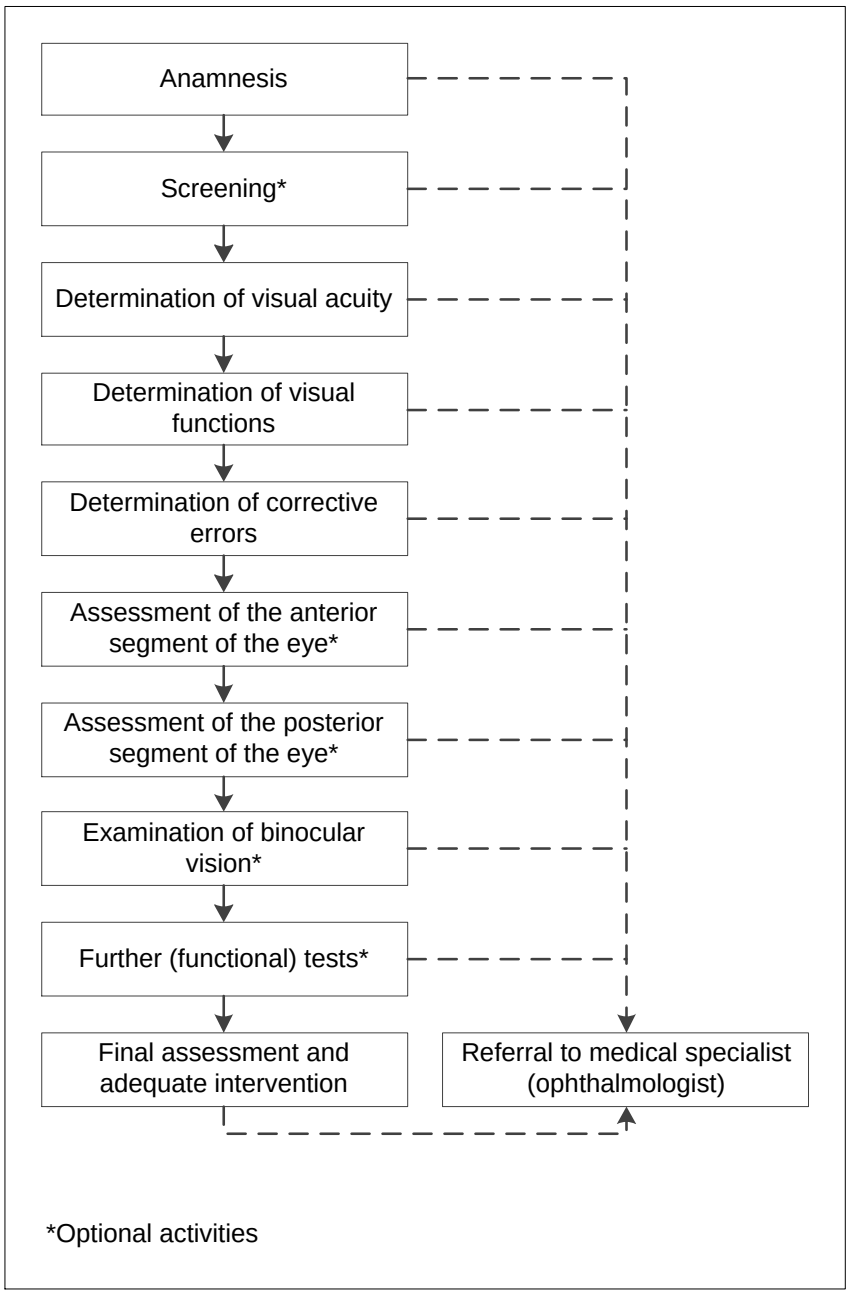
- Assumption of an ophthalmic disease
- Presence of high-grade myopia
- Sudden reduction of visual acuity
- Preschool children who have not received an initial ophthalmologic examination.
  [ZVA 2009b]

Optometrists are, in addition to the above-noted competencies, entitled to examine the interior and exterior of a person's eye using slit-lamps or ophthalmoscopes. In addition, the testing of binocular vision and the sight-testing of low-vision patients might be part of the range of activities [Interview VDCO 2011; Interview ZVA 2011a; Interview ZVA 2011b].

The right to prescribe diagnostic and therapeutic drugs is left exclusively to medical professionals and consequently is denied to German optometrists [Interview VDCO 2011].

All these activities are collected and published in the *Arbeitsrichtlinien für das Augenoptiker-Handwerk*, the relevant working guidelines for opticians in Germany. These working guidelines are the benchmark for the optician's scope of practice, also under German jurisdiction [Wetzel 2010]. With the latest version, the ZVA has for the first time defined in detail the contents of a comprehensive eye examination and thus made possible the unification and standardisation of optometric services in Germany [Friedrich 2010]. The contents are shown in the following figure.

Figure 10: Procedure of a systematic eye examination of the German optometrist



Source: Friedrich [2010]

Based on their scope of practice, German opticians today are more than craftsmen. A wide range of their daily work consists of optometric services that are, in contrast to the French system, officially permitted to German optometrists. Nevertheless, the main source of income for German opticians is still the sale of optical appliances. Depending on the situation and on each professional, many of the optometric services are offered for free and are cross-subsidised by the sale of glasses and contact lenses. The market has a volume of 4.805

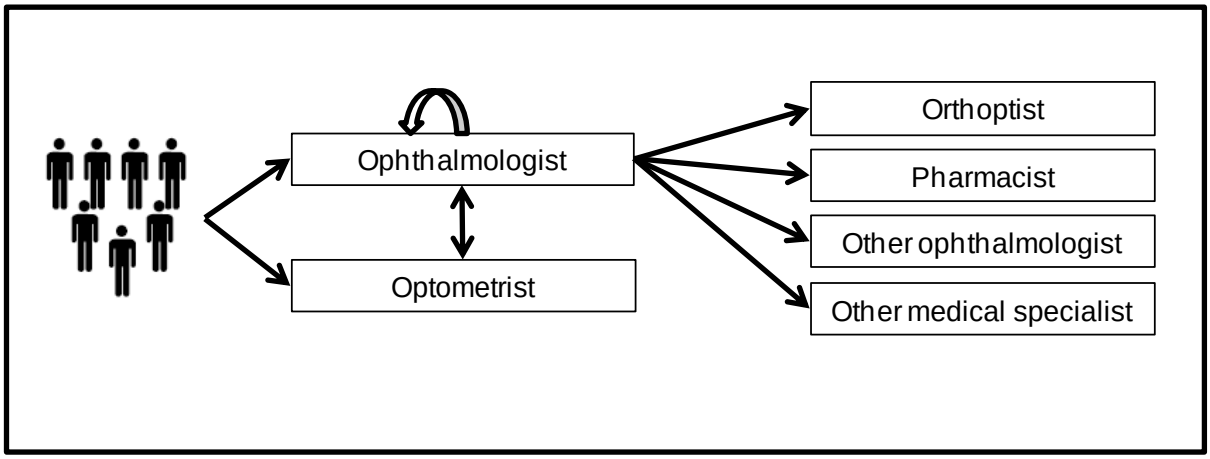
billion €, of which approximately 3.9 billion is derived from the sale and repair of glasses and 0.4 billion from the sale of contact lenses. This means a turnover of approximately 400,000 € per optician's store. Approximately 39 million spectacle wearers and approximately 2.7 million contact lens wearers in Germany purchased about 11 million spectacles in 2009 [Höckmann 2010; Spectaris 2010; Institut für Demoskopie Allensbach 2008].

3.2.4. Organisation of primary eye care

Currently, increased numbers of (academically) well-educated optometrists in the primary eye care market are recognisable. This observation leads to the conclusion that several primary eye care services may be performed by ophthalmologists as well as optometrists. These services include refractions, along with a subsequent prescription of corrective glasses, screening measures (especially screening for glaucoma) or the fitting of contact lenses [Kluth 2008].

In Germany, a free choice of doctors exists; thus, the patient might directly consult the ophthalmologist of his or her convenience. A nationwide gatekeeper system has not yet been established in the German health care system. The models that exist (the so-called *Hausarztzentrierte Versorgung*) are voluntary for patients, and ophthalmologic services are excluded from these patterns. For direct and fast access to optometric services, there are no obstacles, besides a 10 € fee for the first doctor's visit in a quarterly period. Thus, ophthalmologists, as well as optometrists, might be demanded as primary eye care providers. However, the comprehensive medical knowledge of the ophthalmologist and the ability to combine primary and secondary eye care services have to be considered in this context. As the optometrist is obliged to refer patients to ophthalmologists in case of detected ocular abnormalities, complete equivalence between optometrists and ophthalmologists in the field of primary eye care shall not be alleged in this study. The organisation of primary eye care in Germany is constructed as shown in Figure 11.

Figure 11: Patients' pathway through primary eye care in Germany



Source: Institute for Health Care Management and Research

The extent of optometric services has considerably increased in recent years. In 1978, approximately 60 % of the population had ever seen an optometrist for a sight test or an eye examination; however, this number had increased to more than 80 % in 2008 [Institut für Demoskopie Allensbach 2008]. In addition, approximately 73 % of all prescriptions for corrective glasses and 67 % of all contact lens fittings are made by German opticians [Cagnolati 2011]. In 1972, at the time of the first refraction decisions of the German courts (see section 3.2.3.2); the number of prescribed corrective glasses by opticians was only around 5 % [I ZR 104/70]. The increasing demand for optometric services might be a result of the more extensive and uniform distribution of opticians' premises; 3,600 ophthalmologists' practices compete with more than 10,000 opticians' businesses, with at least one educated optometrist on site [Statistisches Bundesamt 2009a; ZDH 2010a]. In addition, the political strengthening of the opticians' and optometrists' competencies and an increasingly higher education level throughout the optometrists' profession might be relevant issues.

Nevertheless, the German ophthalmologist still senses significant influence in primary eye care. Sight tests and eye examinations with an ophthalmologist have not been replaced by the emerging demand for optometric services. Approximately one quarter of the German population, i.e., more than 20 million people, sees at least one ophthalmologist per year, and about 95 % of the population have ever seen an ophthalmologist for sight testing or an examination of the eye [Bertram 2010b]. In cases of vision problems, the German population

relies on ophthalmologists' services. Consequently, approximately 80 % of German adults would consult an ophthalmologist in a case of an assumed medical reason for visual problems, in contrast to only approximately 24 % who would contact an optometrist [Institut für Demoskopie Allensbach 2008].

Both professions perform primary eye care services to an appreciable extent, and for the patient, there is no formal difference with regard to access to care. Regarding the costs of optometric and ophthalmologic services, the situation is the following. Within the SHI-scheme, financial support for optical appliances was most widely abolished with the health care reform of 2004 (*GKV-Modernisierungsgesetz*). Consequently, the share of costs borne by the statutory health insurers decreased from 16.4 % in 2003 to 1.3 % in 2009 [Schmitz 2007; ZVA 2010a]. Since 2004, only children up to 18 years old and insurants with severe eye disease receive reimbursement for the costs of spectacle lenses (not spectacle frames), or – in exceptional cases – contact lenses, from their statutory health insurance. The respective reimbursement rates are fixed in contracts between representatives of the insurers and the opticians. Costs beyond the determined rates have to be paid out-of-pocket by the patient [§33 SGB V]. To obtain reimbursement, an ophthalmologic prescription is necessary [§12 (3) HilfsM-RL].

Ophthalmologic examinations necessary to determine refractive errors and prescriptions for corrective glasses are paid for by the statutory health insurances. The only cost that might occur during an ophthalmologist's consultation is a 10 € fee for the first doctor's visit for outpatient care in a quarterly period. However, in the cases of the ophthalmologic profession, this situation applies to only one out of five patients, because of liberating circumstances or the presence of a previous referral by another physician [Interview BVA 2011]. The same services performed by the optometrist are not reimbursed at all within the SHI-scheme, but they are frequently offered for free or are cleared in cases of a subsequent purchase of corrective glasses [Interview ZVA 2011b].

The situation is different regarding comprehensive eye examinations or other additional services (e.g., screening for glaucoma). These services are not reimbursed within the SHI-scheme if performed by an optometrist. With an ophthalmologist, the statutory health insurers only pay for the consultation if there is a concrete suspicion of the presence of

visual problems or eye diseases. Preventive care services are not included in the statutory benefits basket [Interview BVA 2011]. The fitting of contact lenses for fashionable reasons, instead of wearing spectacles, is charged privately at both points of delivery.

The reimbursement scheme within the SHI system can be summarised as follows:

- There is no reimbursement for optical appliances, except for children up to 18 years old or adults with severe eye diseases.
- Usually, there are no payments for the determination of refractive errors and the subsequent prescription of corrective glasses.
- Private payment is required for preventive services with an ophthalmologist as well as with an optometrist (e.g., screening for glaucoma); the same is true for the fitting of contact lenses.
- In cases of the real or suspected presence of ophthalmic problems, patients do not incur any costs. (These services of diagnosis and treatment are only delivered by ophthalmologists!)

Regarding the private and complementary health insurance market, the reimbursement of costs depends on the individual contract. Both the reimbursement of costs for optical appliances and the reimbursement for preventive services are possible. This reimbursement might apply to ophthalmologists' services and to optometrists' services. The amount and frequency of reimbursement varies according to the contract terms [ZVA 2010b].

Concerns about economical disadvantages due to overlapping activities, accompanied by scepticism about the competence of German optometrists – mainly for reasons of their non-academic and heterogeneous education – lead to an outright refusal on the part of the ophthalmologists to acknowledge the optometric profession in Germany. Consequently, there is a tense atmosphere between the professional associations on the national level. On the regional and local levels, the situation is much better. Although an economic collaboration between opticians and ophthalmologists is legally prohibited [I ZR 182/08], in daily practice, many synergies are exploited. For instance, it is possible that ophthalmologists refer their patients to local opticians for the performance of refractions; opticians, on the other hand, prefer to refer their patients to well-known ophthalmologists in cases of detected abnormalities. Furthermore, it is not extraordinary for optometrists to be

employed as permanent staff in ophthalmologists' practices or at eye clinics [Interview BVA 2011; Interview VDCO 2011].

3.2.5. Organisation of secondary eye care

The organisation of secondary eye care services in Germany, similar to the French system of services provisions, is exclusively the responsibility of ophthalmologists. Each of the 5,626 office-based ophthalmologists performs not only primary eye care services, but also secondary eye care services by treating ocular pathologies or providing emergency care. Approximately 900-1,000 of the office-based practitioners also perform surgeries, whether in their own practices or as office-based specialists with special admitting rights (*Belegarzt*) occupying beds in hospitals or in other professional settings. Many of the ophthalmic surgeries are performed and deducted as outpatient surgeries [Webersin 2011; BÄK 2010].

In addition to office-based practitioners, there are 894 ophthalmologists employed in hospitals. These professionals focus on the diagnosis and treatment of particularly severe and rare cases or they are dedicated entirely to surgical services in inpatient settings. Approximately 200-300 of all secondary care ophthalmologists perform surgeries. Of the approximately 2,000 German hospitals, approximately 330 operate an ophthalmologic department offering secondary eye care services [Webersin 2011; BÄK 2010; GBE-Bund 2011].

The importance of eye surgeries should not be underestimated in the German health care system. With more than 600,000 surgeries each year, cataract surgery is one of the most frequently performed surgeries in the German health care sector. A total of 80-85 % of these interventions are performed as outpatient surgeries, without inpatient stays [Interview BVA 2011; BVA 2011a; BVA 2011b]. Additionally, there is a growing demand for refractive surgeries as an alternative to spectacles. In 2004, 0.2 % of the population underwent refractive surgery; in 1996, the total number of surgeries was approximately 7,000, whereas the number increased to more than 100,000 in 2004 and subsequent years [BVA 2011c]. In contrast to most other secondary eye care services, refractive surgeries are neither reimbursed within the SHI-scheme nor by private or complementary health insurances.

3.3. United Kingdom

Including England, Scotland, Wales and Northern Ireland, the population of the United Kingdom (UK) was approximately 61.8 million in 2009 [ONS 2010a]. The majority of health care in the UK is provided by the National Health Service (NHS), the largest publicly funded health care system in the world [Dougherty 2008]. The NHS was established in 1948 with the aim of making comprehensive health services available to the entire UK population, free at point of use and funded by general taxation [Thompson 2009].[35] These features still apply today, although user fees are charged for some services [Schölkopf 2010; NHS 2010a].[36] Services that are covered through the NHS include inpatient and outpatient hospital care, physician services, drugs, dental care, learning disabilities, mental health care, preventative services and rehabilitation [Boyle 2008].

Aside from the NHS, there is also supplementary private health insurance, which allows faster access to elective surgery as well as more comfortable care and greater choice [Boyle 2008]. Approximately 11 % of the population in the UK is covered by private health insurance, which is purchased either by employers or individuals [Smith, Goddard 2009].

In a broad sense, the health care systems of the four constituent countries of the UK are very similar, as the primary NHS features apply to all nations, and its private health insurance markets are all relatively small [BMA 2010a]. Nevertheless, some divergences between the four health care systems have evolved due to increased devolution[37] within the UK [Smith, Goddard 2009], in the course of which Wales, Scotland and Northern Ireland were empowered to organize and deliver health care within their borders [BMA 2010a]. The NHS in England, Wales, Scotland and Northern Ireland is administered separately, although it is mainly funded from central (UK) taxation [Schölkopf 2010; Thompson 2010].

[35] The NHS is considered as epitome of a tax-financed public health insurance, the so called "Beveridge Model", referring to the Beveridge Report on whose recommendation the NHS was created [Musgrove 2000].
[36] User fees are charged for some prescriptions and optical and dental services [NHS 2010a], although differences exist among the four countries. See, for example, Chaplin [2009] regarding prescriptions.
[37] In the course of devolution, certain powers were transferred from the UK parliament to the newly established Scottish Parliament, the National Assembly for Wales and the Northern Ireland Assembly, which took charge in 1999. Devolved matters included health [Directgov 2010; Smith 2008].

In addition to taxation, which accounted for approximately 80 % of NHS funding in 2006, national insurance contributions (18 %) is the second largest source of funding for the NHS. Only a small amount is made up by patients' payments [OHE 2008a]. Government expenditure on the NHS totalled up to £110 billion (127.79 billion €) in the year 2008-09 for the UK, with the NHS in England spending more than £90 billion[38] (104.56 billion €) [Thompson 2010]. Total health care expenditure, i.e., public and private spending, was £125.4 billion (145.68 billion €) in the UK in 2008, which represented an 8.7 % share of the GDP [Haynes 2009]. This figure is close to the OECD average of 9 % [OECD 2010b].

The following explanations provided in this chapter (3.3) will, unless otherwise stated, refer to England only, which accounts for approximately 84 % of the population in the UK [ONS 2010b]. However, it is not ruled out that some aspects will also apply to one or more of the other three UK countries.

Organization of the English NHS

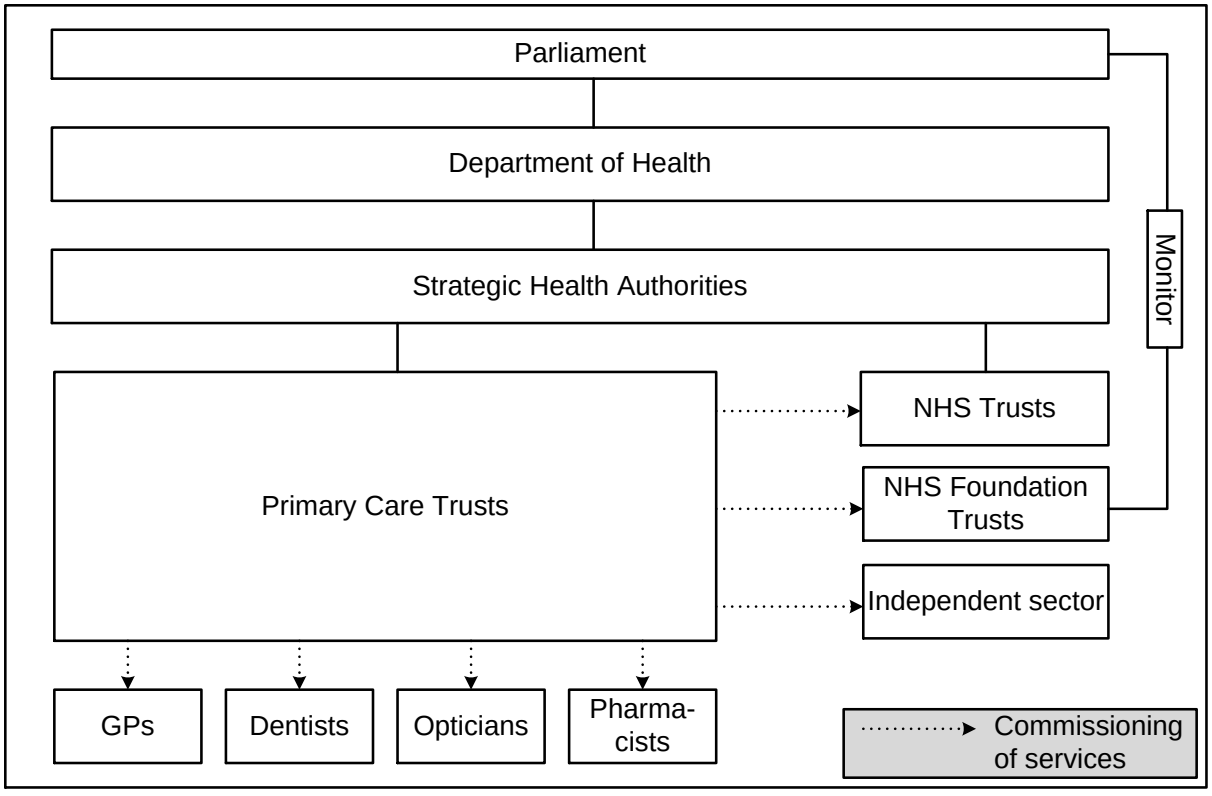
The English NHS is geographically organized [Mason, Smith 2006]. It is controlled by the Department of Health, which is led by the secretary of state for health [NHS 2010a]. As part of its supervision, the Department of Health sets national standards and allocates funds. The supervision of local health areas is not practised directly by the Department, but through 10 Strategic Health Authorities (SHAs) [Smith, Goddard 2009]. These SHAs act as the Department's local headquarters and are responsible for the effective operation of the local health care systems in their area. In this role, they oversee Primary Care Trusts (PCTs), which lead the local health care systems, regarding financial and service performance of PCTs [NAO and Audit Commission 2008]. The 151 PCTs throughout England are central to the NHS; 80 % of the NHS budget is controlled by them [NHS 2010b].

PCTs fulfil their responsibility by commissioning and contracting with a range of health care providers. Primary care is commissioned from self-employed general practitioners (GPs), dentists, opticians and pharmacists, i.e., independent practitioners who act as NHS contractors [NAO and Audit Commission 2008; Turner, Powell 2010]. GPs have an important gatekeeping role within the NHS, as a referral by a GP is required for access to

[38] Expenditure is net of patient charges and receipts.

secondary care, which is the responsibility of medical specialists who exclusively practise at hospitals [Mason, Smith 2006; Bour 2003]. Secondary care is commissioned by the PCTs from NHS trusts, which are public organisations that run hospitals. If those trusts perform well, they may be converted into NHS Foundation Trusts, which are granted more autonomy than NHS trusts. Both types of trusts are mainly funded by contracts held with PCTs and therefore compete for NHS business from PCTs [Smith, Goddard 2009; Mason, Smith 2006]. Primary care trusts also commission care from the independent sector, including private and non-profit providers, whereby competition should be encouraged and access and capacity should be increased [Turner, Powell 2010; Smith, Goddard 2009].[39] Figure 12 summarizes the structure of the NHS in England.

Figure 12: Structure of the English NHS



Source: Institute for Health Care Management and Research based on Galloway [2010]

[39] The current government intends to radically reorganise the English NHS. The government's white paper "*Equity and excellence: Liberating the NHS*" [Department of Health 2010a] provides for the abolition of PCTs and SHAs. The commissioning role will be mainly taken over by GP consortia, which will be accountable for performance and quality to the newly established NHS Commissioning Board [Wise 2010]. The Department of Health's recent business plan [Department of Health 2010b] aims to abolish SHAs by April 2012 and PCTs by April 2013.

The services that PCTs commission from opticians and services that are provided by opticians on private basis will be the main focus in the remainder of this chapter. Here, the term 'opticians' is used in a broad sense, covering optometrists, dispensing opticians and optical businesses in general. Optometrists and dispensing opticians, together with a small number of medical doctors, so-called ophthalmic medical practitioners (OMPs), are considered the three primary eye care providers [Bosanquet 2010]. Optometrists and OMPs examine eyes, perform sight tests and prescribe spectacles and contact lenses. Based on this prescription, dispensing opticians fit and supply spectacles, and some, who hold a special qualification, also fit contact lenses. Services are provided by approximately 7,250 optical practices (UK) [FODO 2010a; College of Optometrists 2011i]. GPs are also involved in primary eye care, as they are often the first contact for patients and act as gatekeepers to secondary eye care, which is provided by ophthalmologists of different grades in hospitals [Bour 2003].

3.3.1. Framework of eye care services

This section proceeds in two parts. First, the regulation of eye care professionals in the UK will be outlined, including its legal and institutional framework. Second, the NHS framework for primary eye care will be elaborated on, describing which NHS primary eye care services are delivered and by whom, as well as how services are funded and on which legal basis this system works.

Regulation of eye care professionals

The main piece of legislation affecting the regulation of optometrists and dispensing opticians in the UK is the Opticians Act. The first version of this legislation, the Opticians Act 1958, firmly established the practice of optometry and dispensing optics and set up the General Optical Council (GOC), which is the regulatory body for the optical professions [Blakeney 2009; Taylor 1986; GOC 2011b]. Following many amendments through legislation in the 1970s and 1980s, the Opticians Act 1958 was replaced by the consolidated Opticians Act

1989, which in turn underwent some significant amendments in 2005[40] [Taylor 1991; Hirji, Clarkson 2006].

The GOC is one of 13 organizations that act as health and social care regulators in the UK. The powers and duties of the GOC are set up by the Opticians Act. The four core functions of the GOC are as follows:

- setting standards for education and training, performance and conduct of the optical profession
- approval of qualifications that lead to registration with the GOC
- maintaining a register of optometrists and dispensing opticians (including students)
- investigation and action in cases in which the fitness to practice, to train or to conduct business of a registrant is impaired

[GOC 2011a; GOC 2011b]. The GOC is also given powers by the Opticians Act to make orders, rules and regulations in relevant areas [GOC 2011p].

As of January 2010, 11,954 optometrists and 5,655 dispensing opticians were registered with the GOC in the UK[41], most of them in England (81 % and 90 %, respectively) [GOC 2010a]. Table 6 shows the number of full registrants by country.

Table 6: Number of optometrists and dispensing opticians by country (UK)

	England	Wales	Scotland	Northern Ireland
Optometrists[1]	9,724	564	1,157	509
Dispensing Opticians[1]	5,082	193	327	53
[1] Figures are as of January 2010.				

Source: GOC [2010a]

Registration with the GOC is mandatory in order to practice as an optometrist or a dispensing optician in the UK. Practicing without registration is illegal [GOC 2011g]. The Opticians Act 1989 restricts the activities of sight testing (section 24), contact lens fitting (s.

[40] The Opticians Act 1989 was amended by 'The Opticians Act 1989 (Amendment) Order 2005'.
[41] There were an additional 460 optometrists and 68 dispensing opticians registered with the GOC. However, these numbers were not attributed to any of the four UK countries [GOC 2010a].

25) and sale of certain optical appliances (s. 27) as well as the use of protected titles[42] (s. 28) to certain registered persons only. Contravening any one of these sections, i.e., performing an activity or using a protected title while unregistered, constitutes a summary offence. For example, section 24 states that it is a summary offence to test the sight of another person while not a registered optometrist or a registered medical practitioner (or an optometry or medical student) [GOC 2011p; Blakeney 2009].

Registrants have to comply with the GOC Code of Conduct [GOC 2010c], which establishes their duties and responsibilities, and if they fail, they put their registrations at risk. By describing principles of good practice, the code establishes the framework of professional conduct for optical professions. There is no other professional GOC guidance apart from the Code of Conduct. Instead, the GOC refers to the detailed guidance issued by other organisations, including that of the professional and representative bodies of the optical professions in the UK, namely the following:

- Association of Optometrists (AOP)
- Association of British Dispensing Opticians (ABDO)
- College of Optometrists
- Federation of Ophthalmic and Dispensing Opticians (FODO)

[GOC 2010c; GOC 2011j].

Ophthalmologists and OMPs are regulated by the General Medical Council (GMC), the regulatory body for medical doctors in the UK [UKBA 2007; GMC 2011a]. The functioning of the GMC is similar to that of the GOC. The four main functions of the GMC, provided under the Medical Act 1983, are to

- maintain registers of qualified doctors
- foster good medical practice
- promote high standards for education and training of the medical profession
- deal with doctors whose fitness to practise is questionable

[GMC 2011a].

[42] The following titles are protected: (registered) optometrist, (registered) dispensing optician, (registered) ophthalmic optician and (registered) optician(s) [GOC 2011p].

In order to practice medicine in the UK, whether privately or in the NHS, it is a statutory requirement that a doctor is registered with the GMC and holds a license to practice. Three registers are held by the GMC. The register of medical practitioners lists all doctors who are registered with the GMC, whereas those eligible to work as consultants in the NHS, e.g., as consultant ophthalmologists, are additionally included in the specialist register. A GP register is maintained for those eligible to work as GPs in the NHS [GMC 2011b; GMC 2011c].

Table 7 gives an overview of the medical workforce in ophthalmology (headcount) in the UK based on figures published by the Royal College of Ophthalmologists (RCO) [Black 2010] and NHS statistics compiled by FODO [2010a].

Table 7: Medical workforce in ophthalmology by country (UK)

	England	Wales	Scotland	N. Ireland
Consultant ophthalmologists[3]	853	53	99	22
SAS ophthalmologists[1,3]	757	49	36	11
Junior doctors in ophthalmology[2,3]	582	43	87	23
OMPs[4]	341	23	10	22

[1] Staff and associate specialists (SAS) include associate specialists, staff grade, trust grade, clinical assistants, senior clinical medical officers and junior fellows.
[2] Junior doctors include doctors in ophthalmic specialist training (OST) and those holding a fixed-term specialist-training appointment in ophthalmology. Not included are those undertaking foundation year 2 training in ophthalmology.
[3] Data refer to December 2007.
[4] Data for England, Wales and Scotland are for 2008; Northern Ireland data refer to 2007-08.

Source: Black [2010]; FODO [2010a] (compiled from NHS statistics)

Except for OMPs, the ophthalmic practitioners listed in table 3 are located in hospitals (secondary care). OMPs work in optical practices in the community, where they are employed to perform eye examinations, just as optometrists do. Some OMPs work exclusively in community practices, but many also work part-time in hospitals in the SAS grades [Bour 2003; UKBA 2007; RCO 2004]. For this reason, some double-counting has to be assumed in the figures.[43]

[43] Faced by the same problem of double-counting, Bour [2003] states that there is no register indicating the exact figures for OMPs working in both hospitals and community practices. Bour refers to two other sources, according to which 55% and 80% of OMPs, respectively, engage in double activity.

NHS framework of primary eye care

NHS eye care services provided in community optical practices are referred to as General Ophthalmic Services (GOS). The purpose of GOS is the provision of preventive and corrective eye care for children, people aged 60 and above, people on low income and people who suffer from or have a predisposition to eye disease. These people are eligible for NHS-funded sight tests, and some are also eligible for NHS optical vouchers, which provide financial support for purchasing glasses and contact lenses [NHS IC 2010a].[44] Both, the NHS sight testing and the provision of optical vouchers form part of the GOS system [Department of Health 2007].

Under section 115 (1) of the National Health Service Act 2006, PCTs are given the duty to provide or secure the provision of primary ophthalmic services. Three levels of services are distinguished:

- mandatory services, i.e., an NHS-funded sight test, conducted at a practice
- additional services, i.e., an NHS-funded sight test, conducted in a domiciliary setting (day centres, residential care homes and patients' own homes)
- enhanced services, i.e., further primary ophthalmic services that a PCT deems necessary

[Department of Health 2008a]

Whereas the first two services must be provided by every PCT, enhanced services may be delivered at the PCTs' discretion, which varies between PCTs. The way for providing primary ophthalmic services is given by section 117 of the Act, which allows PCTs to enter into GOS contracts. GOS contracts for both mandatory and additional services are governed through the General Ophthalmic Services Contract Regulations 2008, which set out the required content for these contracts [Department of Health 2008a]. Enhanced services include those beyond what is required by national GOS regulations, and their commissioning (including price negotiations) is subject to local PCT determination [Department of Health 2010d].

[44] The groups eligible for NHS sight tests and NHS optical vouchers are listed in paragraph 3.3.4.

GOS arrangements require providers of GOS (individuals or corporate bodies) to hold a contract (mandatory and/or additional services contract) with every PCT in whose area they intend to provide services. Performing GOS, i.e., conducting an NHS sight test, is only allowed to be done by an optometrist or an OMP who is recorded on the ophthalmic performers list of a PCT. Although a performer can only be on one PCT list, this recording will authorize him to carry out NHS-funded sight tests all over England [Department of Health 2008a; ABDO et al. 2009; NHS IC 2010b]. As of 31 December 2009, the number of ophthalmic practitioners on PCTs' lists was 10,023, of which optometrists represent the vast majority (9,679, i.e., 96.6 %), whereas OMPs account for only a fraction of the performers (344, i.e., 3.4 %) [NHS IC 2010b].

The GOS sight test fee is negotiated on a national basis between the Department of Health and the Optometric Fees Review Committee, whose four members are FODO, AOP, ABDO and BMA [Department of Health 2010d; AOP 2009; FODO 2010b]. The current fee (1 April 2010 – 31 March 2011) that is paid to a GOS contractor for performing an NHS sight test is £20.70 (24.05 €) [FODO 2010a].

The funding structure of GOS has undergone significant changes recently. The GOS budget has been devolved from the Department of Health to the PCTs since April 2010. Before then, PCTs only administered GOS by handling payment claims for sight tests and vouchers. Costs for GOS could be charged to a central budget that was managed by the Department of Health. This budget was demand-led and not subject to a cash limit (so-called 'non-discretionary' status). Because PCTs assumed responsibility for the GOS budget, funding for GOS now forms part of PCTs' overall and limited budgets (the 'non discretionary' status of GOS ceased). PCTs' total resource allocations have been increased for GOS expenditure, but this is typically an addition of less than 1 % of the overall budget [Department of Health 2010d; Department of Health 2009; Interview AOP 2011]. GOS expenditure for the year 2007/08 accounted for £405 million (470.51 million €) [Department of Health 2009]. On a national level, approximately 55 % of GOS expenditure is devoted to GOS sight test fees (including fees for domiciliary visits), and 45 % is devoted to the costs of optical vouchers [Department of Health 2010d]. The funds spent on GOS represent only a marginal share of approximately 0.5 % of the total NHS expenditure in England, amounting to £85.4 billion (99.21 billion €) in 2007/08 [Thompson 2010].

Excursus: GOS in Wales, Scotland and Northern Ireland

In comparison with the other UK countries, England had the lowest expenditure on GOS per capita (£7.49 (8.70 €)) in 2006/07. Spending on GOS in the other three countries was above the UK average of £8.04 (9.34 €). Scotland had by far the largest expenditure, amounting to £13.03 (15.14 €), whereas Wales (£8.10 (9.41 €)) and Northern Ireland (£ 9.32 (10.83 €)) were closer to England [OHE 2008b]. These figures reflect quite well the differences immanent in the four varying GOS systems.

All four countries have their own GOS regulations. While the GOS system in Wales[1] and Northern Ireland[2] is broadly similar to the English system, as they all have the same sight test fee [FODO 2010a], the Scottish GOS system underwent radical changes in 2006. Based on new GOS regulations[3], which came into force on 1 April 2006, the NHS sight test has been enlarged to a comprehensive eye examination and has been made free to the entire population [ISD Scotland 2010]. The regulations[4] distinguish between a primary and supplementary eye examination and define its content in great detail. Fees for the services are considerably above (primary exam: £37/45 (42.98/52.28 €)) or around (suppl. exam: £21.50 (24.98 €)) that of the GOS sight test fee in England (£20.70 (24.05 €)) [FODO 2010a]. The values of optical vouchers are the same for the entire UK [AOP 2011b].

[1] The National Health Services (General Ophthalmic Services) Regulations 1986
[2] The General Ophthalmic Services Regulations (Northern Ireland) 2007
[3] The National Health Service (General Ophthalmic Services) (Scotland) Regulations 2006
[4] Schedules 3 and 4 of the Scottish GOS regulations define the content of the two examinations.

3.3.2. Education of involved professionals

The three following paragraphs describe the education of the primary eye care providers in the UK: optometrists, dispensing opticians and OMPs.

3.3.2.1. Optometrists

As previously mentioned, the education of optometrists in the UK is subject to GOC regulation. Qualifying as an optometrist requires in sum graduating with an undergraduate degree in optometry and completing a pre-registration period of supervised training. In total,

qualification lasts 4 years (5 years in Scotland) [GOC 2011c; GOC 2011e]. While undergoing training, whether at university or in the pre-registration period, students have to be registered with the GOC [Blakeney 2009]. As of January 2011, 2,844 optometry students were registered with the GOC [Interview GOC 2011b]. The student registration[45] was introduced following amendments to the Opticians Act in 2005 and brought training including patient contact directly under GOC control [Hirji, Clarkson 2006]. Successful completion of training enables full registration with the GOC [GOC 2011e].

There are three different routes to completing required training. The most common one, offered by eight universities, entails the completion of a three-year undergraduate course followed by one year of pre-registration training. The second route entails a four-year undergraduate master course at Manchester University, which includes the pre-registration period. Moreover, there exists a special route for registered dispensing opticians who wish to become optometrists.

Three-year undergraduate bachelor course followed by one year of pre-registration training

Throughout the UK, there are eight GOC-approved universities (Anglia Ruskin University, Aston University, University of Bradford, Cardiff University (Wales), City University, Glasgow Caledonian University (Scotland), University of Manchester, and University of Ulster (Northern Ireland)) that offer undergraduate courses in optometry. Except for the Glasgow Caledonian University (Scotland), whose full-time course takes four years to complete, university courses last three years and lead to a bachelor's degree in optometry [GOC 2010b; GOC n.d.]. Entry requirements vary by university, but usually five General Certificates of Secondary Education (GCSEs) (or the equivalent) at a grade of C or above, including English, and three A-levels around grades ABB in physics, biology, chemistry or mathematics are expected [College of Optometrists 2011b; GOC 2010b].

Courses that universities offer have to comply with the GOC core curriculum and allow students to achieve GOC (stage 1) core competencies in optometry. Competence is expected in communication and professional conduct, visual function and ametropia, optical

[45] Requirements for student registration with the GOC and duties arising thereby are similar to full registration, except for the requirements of professional indemnity coverage and Continuing Education and Training (CET), as well as the lower annual registration fee of £20 (23.24 €) [Hirji, Clarkson 2006; GOC 2010b; GOC 2011k]. Full registration is explained in detail below.

appliances, ocular examination, ocular abnormalities, contact lenses, binocular vision and visual impairment [GOC 2008c]. To assess whether set standards of education are matched, universities are visited periodically by the GOC's visitor panel [GOC 2011d]. GOC powers given by the Opticians Act [section 13(5)-(9)] extend to withdrawing approval of training institutions or granted qualifications.

After graduation with a bachelor's degree, graduates have to complete a pre-registration period, i.e., one year of salaried training in practice under the supervision of a GOC-registered optometrist, accompanied by work-based assessments and a final assessment on the GOC (stage 2) core competencies in optometry. To enter this period, graduates are required to have a degree in optometry of at least 2:2 and a valid Certificate of Clinical Competency[46]. Graduates who fail to meet these requirements have to complete the GOC's Optometry Progression Scheme[47] in order to obtain entry to the pre-registration period [GOC 2011c; GOC 2011e]. The pre-registration training is intended to provide graduates with practical experience in eye care and the optometric profession. Training can be completed in optometry practices, either run by independent practitioners or chains, and in hospitals. [AOP 2006]. Supervisors of pre-registration trainees are granted an allowance by the NHS of £3,015 (3,502.68 €) [Department of Health 2010c].

The College of Optometrists, the 'Professional, Scientific and Examining Body for Optometry in the UK' [College of Optometrists 2011a], manages the pre-registration period on behalf of the GOC [QAA 2007]. The College runs its Scheme for Registration[48], which consists of at least four work-based assessments and a final assessment. Trainees are assessed in the workplace on the GOC (stage 2) core competencies, which number 82. Before the last work-based assessment can take place, the trainee must have undertaken at least 350 refractions and 250 dispensings. The final assessment is held in the form of an objective structured clinical examination, consisting of 14 five-minute clinical tasks assessing GOC (stage 2) core competencies. Trainees who pass can apply for registration with the GOC [College of Optometrists 2010a; College of Optometrists 2009]. The Scheme for

[46] The Certificate of Clinical Competency is awarded upon graduation and is valid for two years [GOC 2011e].
[47] The Progression Scheme gives graduates the chance to meet failed requirements, but candidates are only permitted one attempt, and participation is subject to charges [GOC 2011f]. The University of Bradford [2010a] and Aston University [2011], for example, offer corresponding programmes lasting one year.
[48] The College of Optometrists charges a fee for enrollment with its Scheme for Registration. The current enrollment fee is £3,245 (3,769.88 €) [College of Optometrists 2010b].

Registration is also subject to GOC approval, and GOC visits are conducted periodically [GOC 2011d; GOC 2008a].

Four-year undergraduate master course including the pre-registration period

The University of Manchester offers a four-year master's degree in optometry (MOptom), which includes the pre-registration year; students train for six months in a private practice and six months at an eye hospital. Entry requirements for this master course are similar to those of the 3 year bachelor courses.[49] The MOptom degree has been recognized by the GOC as a registerable qualification [University of Manchester 2011a]. Graduates of the programme are able to achieve all GOC (stage 2) core competencies for optometry [QAA 2007]. The University of Manchester is, along with the College of Optometrists, the second examining body in the UK that offers examinations leading to a qualification that enables registration with the GOC [GOC 2011e].

Career progression course for dispensing opticians

The University of Bradford offers a career progression course for GOC-registered dispensing opticians, allowing them to graduate with a bachelor's degree in optometry in one calendar year. The one-year full-time study at Bradford is preceded by an eight-month period of work-based learning in optometric skills and contact lenses. As with the other bachelor's degrees in optometry, the pre-registration year has to be completed subsequent to university study in order to enable registration with the GOC as an optometrist. To enter this course, a minimum of two years of work experience as a qualified dispensing optician is required [GOC 2010b; University of Bradford n.d.; Whitaker 2010].[50]

There are varying statements on the number of optometry students who pass the final examination annually: the AOP [Interview AOP 2011] states that there are approximately 620 graduates annually, while the GOC [Interview GOC 2011b] indicates approximately 300, which is not even half of the AOP's number.

[49] In detail, entry requirements for the master course at Manchester University are a minimum of five GCSEs at a grade of C or above, including English language and mathematics at a minimum grade of B, and three A-levels at a grade of AAB, with one A in biology and one A in mathematics, physics or chemistry [University of Manchester 2011a].

[50] A registered contact lens specialty was an entry requirement initially, restricting course entry to contact lens opticians. Now, the career progression course is open to both contact lens opticians and dispensing opticians [University of Bradford 2010b; Interview ABDO College 2011; Interview GOC 2011a]. See paragraph 3.3.2.2 for a detailed description of dispensing opticians and contact lens opticians.

GOC registration process

To practice in the UK, optometrists have to fully register with the GOC. Practicing without being registered is illegal. Registration with the GOC has to be renewed each year and is subject to a fee, currently £270 (313.67 €) [GOC 2011g]. Applying for the initial registration as well as the annual renewing of the registration requires that the optometrist submits a health declaration and a declaration about any criminal or disciplinary proceedings against him. Furthermore, optometrists must confirm that they hold professional indemnity insurance coverage [GOC 2011h; GOC 2011i]. The legal framework of GOC registration is provided through the Opticians Act 1989, sections 7-11, and the GOC (Registration) Rules 2005.

Continuing Education and Training (CET)

To remain on the GOC register, optometrists have to participate in the Continuing Education and Training (CET) scheme that is overseen by the GOC. The aim of CET is to ensure that eye care practitioners keep their skills and knowledge up to date. Therefore, they are required to earn a defined number of CET points within a three year cycle. Points can be gained by different modalities, for example, accredited lectures, practical workshops, posters and distance learning. Making CET a mandatory requirement for registrants to stay on the register was enabled by amendments to the Opticians Act in 2005 [GOC 2011o; Hirji, Clarkson 2006]. The legal framework of CET is given by the Opticians Act, sections 11A and 11B, and the GOC (CET) Rules 2005, according to which one general[51] CET point is required for every full month on the register, i.e., 36 points for a full three-year cycle (Rule 12). Within the framework of GOS, the NHS grants payments for losses in earnings in connection with undertaking CET by optometrists. Payments accounted for £468 (543.70 €) in 2009 [Department of Health 2010c].

Further post-graduate education opportunities

Once qualified and registered, optometrists have a wide range of further education possibilities. Probably the most noted options are the specialty qualifications in therapeutics,

[51] Aside from 'general' points, there are also 'specialty' points for those on the GOC specialty registers. This is explained below in the context of the specialty qualifications.

which can be registered with the GOC, allowing optometrists to extend[52] their access to and their use of medicines, including prescribing. Additional Supply and Supplementary Prescribing were introduced in 2005, followed by Independent Prescribing in 2008 [College of Optometrists 2010c; GOC 2011l]. Training for supplementary prescribing is no longer offered [Interview College of Optometrists 2011] – after the introduction of Independent Prescribing, it is no longer regarded as being of interest to optometrists. Qualifying for Independent Prescribing brings optometrists a much greater scope of practice for minimal additional training [Interview AOP 2011]. Independent Prescribing optometrists can diagnose and treat independently of a doctor, including the prescribing of drugs [Loffler 2009]. As of now, only a fraction of optometrists have obtained specialty qualifications and entered their names on the corresponding GOC specialty registers:

- Additional Supply: 32
- Supplementary Prescribing 12
- Independent Prescribing 62

[Interview GOC 2011b]. Taking into account a total of 12,414 GOC-registered optometrists [GOC 2010a], less than 1 % of practitioners account for these specialty registrations. The training required to qualify in therapeutics is outlined in Appendix 5: Further qualifications for UK optometrists. This appendix also contains a brief overview of further qualifications optometrists can obtain, namely the certificates and diplomas from the College of Optometrists and postgraduate courses (master's degrees and doctorates) offered by universities.

3.3.2.2. Dispensing Opticians

The method that the GOC regulates the education of dispensing opticians is mostly analogous to the regulation of the optometric education. In sum, qualifying as a dispensing optician requires completing a course in dispensing optics, completing a period of supervised work in practice and passing the final examinations of the ABDO [GOC 2010b]. The qualification takes three or four years and can be completed via four different routes:

[52] Even 'normal' optometrists are allowed to use various diagnostic and therapeutic drugs, as they are granted exemptions from the rules of the Medicines Act 1968, which governs the use and supply of medicines. These exemptions are referred to as 'entry level' [Titcomb, Lawreson 2006; College of Optometrists 2010c].

- Two years of full-time training at a GOC-approved training institution followed by one year of supervised work in practice
- Three years of full-time training at a GOC-approved training institution followed by one year of supervised work in practice
- Three years of training on a day-release basis at a GOC-approved training institution while working in supervised practice
- Three years of training on distance-learning basis at a GOC-approved training institution while working in supervised practice

[Interview GOC 2011a]. Aside from different routes, which obviously provide for different times of undertaking work in practice, various qualifications can be distinguished. Qualifications include the Bachelor of Science (BSc), the Foundation Degree and the Diploma of Higher Education (DipHE), usually awarded in the subject "Ophthalmic Dispensing" [GOC n.d; Interview GOC 2011a]. As of January 2011, 1,655 dispensing optician students were registered with the GOC [Interview GOC 2011a].

In total, training courses in dispensing optics are approved by the GOC at six training institutions in the UK: ABDO College, Anglia Ruskin University, Bradford College, City and Islington College, City University and Glasgow Caledonian University. Entry requirements for courses are usually 5 GCSEs (or the equivalent) at a minimum grade of C, including the subjects English, Mathematics and Science [GOC 2010b; GOC 2011e]. Nevertheless, course descriptions for different training establishments show that required standards vary between courses and institutions. A-levels, work experience or an employment by a registered optician may be required additionally or alternatively for some courses.[53] Training courses must comply with the GOC core curriculum and deliver the GOC core competencies for dispensing opticians. GOC visits to training institutions also take place [GOC 2008d].

Parallel or subsequent to their course study, dispensing optician students have to work in practice under the supervision of a registered dispensing optician[54]. This step is referred to as the Pre-Qualification Period. The aim of this period is for students to gain the skills and knowledge necessary to register as dispensing opticians. Therefore, trainees have to

[53] See, for example, course descriptions from Bradford College [2011], Anglia Ruskin University [ARU 2011a] or ABDO College [2011].

[54] It is also possible that an optometrist or ophthalmic medical practitioner assumes responsibility for the supervision of a dispensing optician student during his pre-qualification period [ABDO 2011b].

complete at least 1,600 hours of supervised training in no less than 200 days and undertake 250 spectacle frame fittings, 250 spectacle frame adjustments and 250 checks of completed spectacles [ABDO 2011b; GOC 2008a].

The ABDO runs in conjunction with the training institutions[55] qualifying examinations. These exams have to be passed by every student in order to register as a dispensing optician, irrespective of the education route students have taken and the qualification they are awarded by the training institution [GOC 2011e; Interview ABDO College 2011]. The ABDO is the qualifying body for the profession of dispensing opticians in the UK, and only its FBDO[56] qualification allows for registration with the GOC [ABDO 2011a; Interview GOC 2011a].[57] ABDO examinations are also subject to auditing by the GOC [GOC n.d.; GOC 2011d]. Statements regarding the number of dispensing optician students passing the final examination each year vary: the GOC [Interview GOC 2011a] indicates that 280 dispensing opticians qualify each year, and the ABDO College [Interview ABDO College 2011] indicates that 350 to 400 students pass each year. According to the AOP [Interview AOP 2011], there are 450 graduates.

Upon completion of training, students can apply for entry on the full register of the GOC. The (annual) registration process is identical to that of optometrists [GOC 2011h; GOC 2011i].[58] Once registered, participation in the CET scheme becomes mandatory. To stay on the register, registered dispensing opticians must collect one general CET point for each month on the register, totalling up to 36 points per three year CET period [The GOC (CET) Rules 2005, rule 12; GOC 2011o].

Further post-graduate education opportunities

Qualified dispensing opticians have the choice between a number of further post-graduate education offers, including a registerable specialty with the GOC, allowing them to fit

[55] Many training institutions apply for exemption to the ABDO theoretical examinations, and students take the institutions' own theoretical examinations. However, all students are required to complete the practical examinations of the ABDO [Interview ABDO College 2011; ABDO 2011c].
[56] FBDO is the Fellowship Diploma of the Association of British Dispensing Opticians [GOC 2011q].
[57] Although the FBDO qualification of ABDO is currently the only fully approved dispensing qualification by the GOC that allows registration as a dispensing optician, the GOC has recently granted provisional approval to the Foundation Degree in Ophthalmic Dispensing of the Anglia Ruskin University. Subject to full approval, graduates (post 2013) of the course are allowed to register as Dispensing Opticians, bypassing the FBDO examinations of the ABDO [Interview GOC 2011a; ARU 2011b].
[58] See chapter 3.3.2.1 for the registration process of optometrists.

patients with contact lenses and provide related aftercare [GOC 2011r]. A total of 1,287 dispensing opticians have registered for this 'contact lens specialty' [Interview GOC 2011a], accounting for 22.5 % of the total number of the 5,723 professionals [GOC 2010a]. Training to become a contact lens optician is composed of theory modules and supervised practice-based learning and takes usually one and a half to two years [GOC 2011r; Interview ABDO College]. The ABDO College, City and Islington College, and Bradford College run corresponding training courses. All courses prepare students to sit for the examination for the ABDO Contact Lens Certificate (FBDO CL), which is an approved contact lens qualification [ABDO et al. n.d.; Ewbank 2009]. The contact lens specialty is subject to regulation by the GOC: training is based on GOC core competencies for contact lens practice [GOC 2011r], ABDO examinations are visited periodically by the GOC [GOC n.d.] and additional CET requirements are imposed on contact lens opticians [GOC 2011n]. An overview of further qualifications dispensing opticians can obtain from the ABDO is given in Appendix 6: Further qualifications for UK dispensing opticians. The career progression programme for dispensing opticians seeking to become optometrists has already been outlined in chapter 3.3.2.1, which detailed the education of optometrists.

3.3.2.3. Ophthalmic Medical Practitioners

OMPs are medical doctors with sufficient qualifications and experience in ophthalmology such that they have been authorized to work in the framework of GOS in order to carry out NHS-funded sight tests [RCO 2010; Smith, Bhagey 2004].[59] It can be assumed that qualifications and experience vary between OMPs: on the one hand, it is indicated that there are numerous doctors in training who work as OMPs to make extra money [RCO 2006]; on the other hand, it is presumed that a considerable number of OMPs are close to retirement [Smith, Bhagey 2004]. However, OMPs are said normally to hold a postgraduate qualification in ophthalmology [Smith 2005]. Therefore, it appears appropriate to outline the full education of ophthalmologists, including postgraduate specialty training in ophthalmology, before going into the details of the requirements doctors must meet to be approved as OMPs.

[59] The OMP status entitles one only to join the GOS system. To perform NHS sight tests, OMPs are still required to be recorded on a PCT performer list, which authorises them to conduct NHS sight tests all over England. In Wales, Scotland and Northern Ireland, separate ophthalmic lists are held [NHS IC 2010a; ABDO et al. 2009]

As of 1 April 2010, all stages of medical education and training in the UK are subject to regulation by the GMC [GMC 2011d].[60] Generally speaking, three stages of medical training can be distinguished. After five years of undergraduate training at medical school, graduates have to complete two years of basic medical training, called the 'foundation programme', before starting specialty (or GP) training, which differs in duration depending on the specialty. Specialty training in ophthalmology is seven years in duration [BMA 2010b; RCO 2011a].

Throughout the UK, there are approximately 30 medical schools that are recognised by the GMC, most of them associated with one university that awards the medical degree [GMC 2011e; GMC 2011f]. Entry requirements vary from school to school, but usually they include three excellent A-levels (AAA or AAB), including chemistry and biology or another science subject. In addition, an admission test has to be completed by the applicants of most medical schools. Undergraduate training is provided through different approaches.[61] The traditional course is split into a two year pre-clinical course and approximately a three year clinical course. The pre-clinical portion includes the study of basic medical sciences; the clinical stage involves supervised work in hospital wards and attending lectures [BMA 2010b]. Outcomes for graduates and standards for the delivery of undergraduate medical education are determined by the GMC in its guide, 'Tomorrow's Doctors' [GMC 2009a]. To assure the quality of delivered training, the GMC conducts visits to medical schools [GMC 2011g].

After medical school, graduates have to complete the foundation programme, i.e., two years of supervised workplace-based training in different specialties, typically arranged through six placements, lasting four months each. The first year often includes medicine and surgery. In the second year, many foundation doctors complete a placement in general practice. During the first year, trainees are required to hold a provisional registration with the GMC and are allowed to apply for full registration with the GMC after achieving the prescribed outcomes at the end of this year [UKFPO 2010; AOMRC 2007].[62] All trainee doctors follow the

[60] The GMC merged with the Postgraduate Medical Education and Training Board on 1 April 2010.
[61] Aside from traditional courses, several medical schools offer courses that combine the pre-clinical and clinical stages into one 'integrated course'. The third approach entails multi- or inter-professional courses, whereby medical students learn together with students of other professions the same content [BMA 2010b].
[62] Doctors must register with a 'licence to practice' with the GMC in order to practise medicine in the UK. Licences were introduced in November 2009. Registration without a licence is still possible, but it does not allow one to practice medicine in the UK [GMC 2009b].

foundation programme curriculum, which has been approved by the GMC as meeting its standards, allowing trainees to meet the requirement for full registration [GMC 2011i]. Standards for the foundation training and the required outcomes for full registration are set by the GMC in its guide, 'The Trainee Doctor' [GMC 2011h], which also contains standards and requirements for the specialty training.

For ophthalmology, the Royal College of Ophthalmologists (RCO) has developed the 'Ophthalmic Specialist Training' (OST) curriculum [RCO 2011b]. It provides for seven years of training, over the course of which the trainee doctor must pass several examinations set by the RCO [RCO 2011a]. The first two years of OST are designed to provide general ophthalmic training. Trainees are expected to acquire basic ophthalmic examination methods and techniques and learn how to manage general ophthalmic outpatients as well as accident and emergency patients. In order to gain experience in surgical interventions, trainees undertake two theatre sessions per week. At the end of the second year, trainees are required to pass Part 1 of the Fellowship Examination of the RCO (FRCOphth Part 1) to progress within OST. In the following years of OST, during which an increasing amount of time is spent in general and specialist clinics and between the two and three theatre and laser sessions that are attended on average per week, trainees acquire specialist surgical and clinical skills. Performing a sufficient number of surgeries, especially cataract procedures, is considered an essential element of OST. By the end of the third year, the Refraction Certificate Examination, which tests the understanding of clinical refraction, has to be passed [RCO 2009a; RCO 2009b]. In year six or seven, trainees may deepen their experience in a generic specialty that is of importance to ophthalmology, e.g., epidemiology or healthcare management, or in a sub-specialty of ophthalmology, e.g., glaucoma, ophthalmic oncology or refractive surgery [RCO 2011b; WRT 2008]. At the end of the seventh year, Part 2 of the Fellowship Examination (FRCOphth Part 2) must be passed, which covers learning outcomes spanning the entire OST curriculum. Passing this examination leads to the award of the Fellowship of the Royal College of Ophthalmologists (FRCOphth) [RCO 2011c]. Moreover, successful completion of OST leads to a Certificate of Completion of Training (CCT), which qualifies for entry into the GMC specialist register [RCO 2009a; N.N. 2010]. Only those doctors on the specialist register can be appointed as consultants in the NHS [RCO 2011a].

It is important to consider that the medical workforce in hospitals in the UK, irrespective of specialty, is not only composed of consultants and doctors in foundation or specialty training but also comprises the group of staff and associate specialists, which is abbreviated as 'SAS doctors'. Like consultants, SAS doctors are senior doctors, i.e., they are no longer in training. However, SAS doctors have undergone some training, but in most cases the specialist training has not been completed [BMA 2009]. Ophthalmology is a specialty that is heavily reliant on this SAS group, particularly in outpatient departments [RCO 2008]. In England, the level of involvement of SAS doctors in ophthalmology is one of the highest among all specialties [BMA 2006]. The RCO offers also a suitable postgraduate ophthalmic qualification for SAS doctors, the Membership of the Royal College of Ophthalmologists (MRCOphth). To obtain this qualification, doctors are required to pass the RCO examinations for the Refraction Certificate and the Diploma in Ophthalmology (DRCOphth). One of the benefits of the MRCOphth advertised by the RCO is the opportunity to apply, using this qualification, for admission as an OMP [RCO 2011d].

Working as an OMP requires that a doctor is registered in the Central Professional List of Medical Practitioners. This list of OMPs is administered by the British Medical Association (BMA), and applications to this list are overseen by the Ophthalmic Qualifications Committee [UKBA 2007; RCO 2010]. To be admitted to this list, doctors are generally expected to have held approved training posts in ophthalmology for at least two years and to hold the MRCOphth or an equivalent qualification [Smith, Bhagey 2004]. The process for approving doctors as OMPs, including required qualifications and experience, is, in England, governed by the National Health Service (Performers Lists) Regulations 2004[63], regulation 36-38. Approval as an OMP by the Ophthalmic Qualifications Committee is a requirement for inclusion in a PCT performer list, which in turn is required for being allowed to perform NHS sight tests in England [Department of Health 2008b].

3.3.3. Scope of practice of involved professionals

Education forms the basis for any type of practice in the career of an optometrist, a dispensing optician or an OMP. Therefore, the preceding paragraphs have occasionally

[63] As amended by the National Health Service (Performers Lists) Amendment and Transitional Provisions Regulations 2008.

already touched on the scope of practice of primary eye care professionals. The three following paragraphs will now elaborate on these.

3.3.3.1. Optometrists

Once an optometrist is qualified and registered, he can work in various settings. Two surveys conducted in 2006 [Needle et al. 2008] and 2007 [College of Optometrists 2008] indicate that over 90 % of optometrists are community optometrists, working either in independent or corporate practices or as locums. Only a small proportion (3 % and 6 %, respectively) work in hospitals. Outlining the scope of practice of community optometrists, their services could be described as the testing of sight and the examination of eyes, the prescribing of spectacles and contact lenses and their fitting and dispensing [AOP 2008; College of Optometrists 2011i]. In addition, optometrists also undertake a number of activities that go beyond the basic sight test. Over the last decade, enhanced primary eye care services have been developed, often in cooperation with ophthalmologists, to relieve the burden on hospital eye services (secondary eye care), which has expanded optometrists' involvement in clinical practice [Bosanquet 2010; AOP 2008; College of Optometrists 2008]. This development was accompanied by some important legal changes. On the one hand, the duty of optometrists to refer patients was relaxed in 1999, providing optometrists with the opportunity to manage certain ocular conditions. On the other hand, optometrists' access to medicines was improved in 2005 and 2008 [Lawrenson 2005; Needle et al. 2008; College of Optometrists 2010c].

The testing of sight is regulated in section 24 of the Opticians Act 1989, which restricts this function to registered optometrists and registered medical practitioners (doctors).[64] In conducting a sight test, an optometrist (or a doctor) is required to perform certain duties set out in section 26 of the Opticians Act and in the Sight Testing (Examination and Prescription) (No 2) Regulations 1989 [Blakeney 2009]. The latter states that, in testing the sight of another person, it is the doctor's or optometrist's duty "to perform, for the purpose of detecting signs of injury, disease or abnormality in the eye or elsewhere

(i) an examination of the external surface of the eye and its immediate vicinity

[64] In addition, medical students and optometry students are allowed to test sight [Opticians Act 1989, section 24(2); The Testing of Sight by Persons Training as Optometrists Rules 1993, rule 3]

(ii) an intra-ocular examination, either by means of an ophthalmoscope or by such other means as the doctor or optometrist considers appropriate,

(iii) such additional examinations as appear to the doctor or optometrist to be clinically necessary"

[The Sight Testing (Examination and Prescription (No 2) Regulations 1989, Regulation 3(1)]. These requirements apply to both NHS (GOS) sight tests and private sight tests. In addition, when performing an NHS sight test, optometrists are bound to the GOS regulations, which vary by country[65] [Shah et al. 2007a]. Scotland differs significantly from the other three countries, as the Scottish GOS regulations specify in detail the procedures an optometrist has to include in an NHS primary eye examination. Although in England, Wales and Northern Ireland it is up to the optometrists to decide what to include in an NHS sight test, they always take symptoms and history, perform refraction, assess binocular vision and conduct an external and internal examination of the eye. If clinically indicated, visual field examination and tonometry are also part of an NHS sight test. At the least, these core procedures are also conducted within a private sight test [Interview AOP 2011; AOP 2000]. An optometrist has the legal requirement to give the patient a prescription for an optical appliance subsequent to the sight test or a written statement that an optical appliance is not necessary. Additionally, the optometrist has the duty to issue a written statement, saying if the patient is being referred to a doctor or not, and in the case of referral, its reason [Opticians Act 1989, s. 26(1)(b)(ii) and s. 26(2)].[66]

The duty of optometrists concerning the referral of patients is specified in the GOC's 'Rules relating to Injury or Disease of the Eye'. Amendments to these rules in 1999 removed the obligation to refer every patient suffering from an abnormality of the eye to a doctor. Instead, optometrists have been allowed to use their own professional judgement to determine whether or not to refer a patient with an injury or disease of the eye. These amendments, which took effect in 2000, have provided optometrists with the legal basis for the management of certain conditions falling within their area of expertise and competence,

[65] See the excursus 'GOS in Wales, Scotland, and Northern Ireland' at the end of chapter 3.3.1

[66] The Sight Testing (Examination and Prescription) (No 2) Regulations 1989 specify the particulars that have to be included in a prescription for an optical appliance or in a statement claiming that appliances are not necessary (regulation 5), but they also include exceptions to the duty of issuing a prescription or statement (regulation 4). Moreover, the regulations repeat the duty concerning the written statement of (non) referral (regulation 3(1)(b)) and include exceptions for this (regulation 3(3)).

i.e., especially common, non-sight-threatening eye diseases [Lawrenson 2005; Needle et al. 2008; AOP 2001].

Optometrists are allowed under the Opticians Act 1989 to fit contact lenses and to sell optical appliances [Opticians Act 1989, s. 25 and 27]. While there are currently still many optometrists who dispense spectacles and fit contact lenses on their own, there is a trend of optometrists leaving these activities to others. The number of optometrists involved in spectacle assembly is very small, as this activity is usually performed by optical technicians [Interview AOP 2011; Interview ABDO College 2011].

Probably the most remarkable changes in recent years regarding the scope of practice of optometrists have taken place in the area of therapeutics via the introduction of Additional Supply, Supplementary Prescribing and, in particular, Independent Prescribing specialties. As already ascertained, less than 1 % of UK optometrists hold such a specialty registration (see chapter 3.3.2.1) and are able to obtain access to medicines via this route. However, even 'normal' optometrists have access to medicines, as all optometrists are permitted exceptions from the general rules of the Medicines Act 1968 [College of Optometrists 2010c].

Excursus: Medicines Act 1968

The sale, supply and administration of medicines in the UK are regulated by the Medicines Act 1968 and associated secondary legislation. The Medicines Act differentiates between three classes of medicines, determining the way in which they are made available to the public. The sale and supply of pharmacy (P) medicines and prescription only medicines (POMs) is restricted to registered pharmacies and must be conducted by or under supervision of a pharmacist. POMs, in addition, require a prescription from an appropriate practitioner, e.g., a doctor or dentist. General Sale List (GSL) medicines can be sold from a wider range of retail outlets, e.g., supermarkets [MHRA 2005a; MHRA 2005b].

Exceptions to the general rules of the Medicines Act have traditionally been granted to optometrists.[67] The so-called 'entry level' exemptions allow all optometrists the use and, in

[67] The legislation that provides exemptions from the general rules of the Medicines Act 1968 for optometrists is 'The Prescription Only Medicine (Human Use) Order 1997, 'The Medicines (Pharmacy and General Sale—Exemption) Order 1980', and 'The Medicines (Sale or Supply) (Miscellaneous Provisions) Regulations 1980' [MHRA 2005b].

certain circumstances, even the supply of some POMs. The list of POMs available to all optometrists was updated through changes in medicine legislation in 2005.[68] All listed drugs, both diagnostic and therapeutic, can be used by optometrists. Optometrists can also supply the listed POMs directly to the patient in an emergency or routinely issue a signed order against which a pharmacist supplies the POMs to the patient. Excluded from this practice are topical anaesthetics, which are for use only. The aforementioned legislative changes in 2005 also allowed optometrists to directly supply to the patient P medicines used in the course of their professional practice. Although prior to 2005 optometrists had already been allowed to use P medicines, the supply had been restricted to emergencies. The removal of the emergency restriction was also enacted for the supply of GSL medicines, which of course can also be used by optometrists [Titcomb, Lawrenson 2006; Lawrenson 2005; College of Optometrists 2010c; Lawrenson et al. 2007].

The small group of optometrists holding a specialty registration in additional supply, supplementary prescribing or independent prescribing has an extended scope of therapeutic practice. Since June 2005, 'additional supply optometrists' are provided with access to a range of POMs in addition to what is on the entry level list available to all optometrists.[69] The intention of additional supply is to enable optometrists to manage a number of common non-sight threatening conditions, such as infective and allergic conjunctivitis, blepharitis, dry eye and superficial injury. The handling of POMs on the additional supply list is the same as those on the entry level list [Titcomb, Lawrenson 2006; College of Optometrists 2010c; Lawrenson et al. 2007].

It was also in June 2005 when supplementary prescribing was extended to optometrists.[70] This concept provides that supplementary prescribers (here, optometrists) manage the clinical conditions of patients and prescribe medicines according to a clinical management plan that has been set up in cooperation with and following the diagnosis by an independent prescriber, e.g., a GP or an ophthalmologist [GOC 2011l; Loffler 2009; Titcomb, Lawrenson

[68] The entry level list of POMs was updated through 'The Medicines (Pharmacy and General Sale—Exemption) Amendment Order 2005' [Titcomb, Lawrenson 2006].
[69] The additional supply list of POMs was defined by 'The Medicines for Human Use (Prescribing) (Miscellaneous Amendments) Order 2005' [Titcomb, Lawrenson 2006].
[70] The inclusion of optometrists in the group of healthcare professionals who are allowed to practice as supplementary prescribers was realised by 'The Medicines (Sale or Supply) (Miscellaneous Amendments) Regulations 2005' [Titcomb, Lawrenson 2006].

2006]. Due to these requirements, this prescribing partnership has a limited scope in community practice and is more suitable for hospital optometrists who work in medically led teams [Needle et al. 2008].

The expansion of optometrists' scope of therapeutic practice culminated in 2008 with the introduction of independent prescribing for optometrists.[71] Independent prescribing enables optometrists to diagnose and treat independently from doctors, including prescribing drugs. Any licensed drug for ocular conditions that affect the eye and its surrounding tissues can be prescribed. The range of available medicines is not restricted legally, but by reference to the recognized area of expertise and competence of the individual optometrist [College of Optometrists 2010c; Loffler 2009]. Optometrists are asked upon registration of the independent prescribing specialty to declare their intended area of practice, e.g., glaucoma [GOC 2011l].

Evidently, legislation provides UK optometrists with a broad scope of practice. Expanding trends in legislation are in line with actual developments in practice, which are characterized by the evolvement of enhanced primary eye care services. Optometrists' involvement in enhanced services might, for example, include pre- and post-operative cataract care, monitoring of patients with stable glaucoma, treatment of minor eye conditions (in conjunction with GP), referral refinement or the provision of low vision assessments and appliances [AOP 2008; Interview AOP 2011]. Although the extent to which optometrists participate in such services is not well known, the treatment of minor eye conditions seems to be common among optometrists. A survey conducted by Needle et al. [2008] in 2006 indicated that 75 % of optometrists frequently manage dry eye and that 74 % frequently manage blepharitis/lid problems. Other common, non-sight-threatening conditions, such as allergic and infective conjunctivitis and simple corneal abrasion, were managed frequently or occasionally by the majority of respondents. The Clinical Practice Survey of 2007 from the College of Optometrists [2008] indicated less involvement by optometrists in the management of minor eye conditions than indicated by the Needle survey, with 55 % of optometrists managing dry eye and 34 % managing red eye. According to the College survey, approximately one in five optometrists is involved in NHS-funded referral refinement.

[71] Optometrists were added to the list of independent prescribers through 'The Medicines for Human Use (Prescribing) (Miscellaneous Amendments) Order 2008' [Wingfield Works 2008].

3.3.3.2. Dispensing Opticians

Most dispensing opticians work in corporate or independent optical practices, closely alongside optometrists, and some are even owners of practices [GCU 2011; Department of Health 2007]. Their services comprise the fitting and supply of spectacles and, provided they have the registered contact lens specialty, the fitting of contact lenses. In addition, dispensing opticians are involved in low vision services for the partially sighted [GOC 2010b]

Sections 25 and 27 of the Opticians Act 1989 are relevant to the scope of practice of dispensing opticians. While dispensing opticians are not allowed to perform sight tests (section 24), section 27 allows them the sale and supply of optical appliances. The three main categories of optical appliances are spectacles, powered (sight-correcting) contact lenses and zero-powered (plano) contact lenses [GOC 2006]. Dispensing opticians supply spectacles on the basis of the prescription that is issued to the patient following a sight test by an optometrists or OMP. They advise the patient on frames and lens types; take measurements of frames, face and lenses; provide the optical manufacturer with specifications and instructions; and finally check finished spectacles before handing them over to the patient [ABDO 2011e; FODO 2010a].

Aside from fitting spectacles, contact lens opticians may also fit contact lenses. Every fourth to fifth dispensing optician has decided to extend his scope of practice by acting as a contact lens optician (see chapter 3.3.2.2). The fitting of contact lenses is governed by section 25 of the Opticians Act[72] and it may only be conducted upon presentation of a valid spectacle prescription by the patient. On completion of the fitting, the patient must be provided with a contact lens specification, containing sufficient information for the replication of lenses. These requirements, set out in section 25 (1A) and (5) of the Opticians Act, apply irrespectively of whether the fitter is a contact lens optician, an optometrist or a doctor. While the spectacle prescription is required for both sight-correcting and plano contact

[72] Section 25 of the Opticians Act basically does not exclude even 'normal' dispensing opticians from performing contact lens fitting. It is the Contact Lens (Qualification etc.) Rules 1988, made under the Opticians Act, that restrict this activity to those dispensing opticians who hold an approved qualification and are listed in the GOC specialty register [ABDO 2011f]. Both the Contact Lens Certificate (FBDO CL) and the Diploma in Advanced Contact Lens Practice (FBDO (Hons) CL) are approved qualifications [ABDO et al. n.d.].

lenses, there is no legal requirement to issue a specification after fitting plano contact lenses [Purslow 2010].

Contact lens opticians have been allowed through legislation[73] in late 2009 to use certain POMs (anaesthetics) during the contact lens fitting. Moreover, 'normal' dispensing opticians were allowed to order these and some other POMs for their optical practices – this ordering had previously been limited to optometrists and OMPs only [Bailey 2010; Rapley 2010]. Further legislation[74] from 2009 permitted dispensing opticians the sale and supply of the anti-infective drug chloramphenicol under its pharmacy (P) license, which is therefore subject to certain restrictions, including that it is solely for patients suffering from acute bacterial conjunctivitis [McNamee 2010; Bailey 2010].

Another field of activity for dispensing opticians is low vision services. According to the guidelines of the ABDO [2011f], registered dispensing opticians may legally conduct low vision assessments and supply low vision aids. Following the guidelines, techniques used to verify the performance of supplied low vision aids do not constitute sight testing in the sense of section 24 of the Opticians Act.

The guidelines of the ABDO [2011f] list the so-called 'delegated functions' that may be performed by dispensing opticians in support of optometrists and doctors. Provided that they have the appropriate skills and knowledge, dispensing opticians may conduct, for example, refraction or tonometry. According to the interview partner from the ABDO College [Interview ABDO College 2011], subjective and objective refraction can be legally performed by dispensing opticians, though they cannot prescribe from obtained results. Tonometry can also be performed, but likewise, the results cannot be interpreted by dispensing opticians.

The Rules relating to Injury or Disease of the Eye 1999 obligate dispensing opticians to refer a patient suffering from an injury or disease of the eye to a doctor (rule 3). But as with optometrists, dispensing opticians are granted derogations. They may decide not to refer to

[73] Relevant legislation is 'The Medicines for Human Use (Miscellaneous Amendments) (No.2) Regulations 2009'.
[74] Relevant legislation is 'The Medicines (Exemptions and Miscellaneous Amendments) Order 2009'.

a doctor if there is, in their professional judgement, no justification for doing so (rule 6), but they are also given the option to refer to an optometrist instead of a doctor (rule 7(a)).

3.3.3.3. Ophthalmic Medical Practitioners

OMPs work mainly in optical practices, either exclusively or part-time in combination with part-time employment as a hospital ophthalmologist [Bour 2003; RCO 2004]. As ophthalmologists, OMPs have the same scope of practice, including prescribing rights, as any other ophthalmologist [Interview AOP 2011]. However, it is their function as OMPs that is the focus of the following section, as this represents their involvement in (NHS) primary eye care. A brief overview of ophthalmologists working in hospitals (secondary eye care) is given in chapter 3.3.5.

As registered medical practitioners (doctors), OMPs are allowed through section 24 of the Opticians Act 1989 to perform sight testing. When conducting a sight test, they are bound to the provisions of section 26 of the Opticians Act and the Sight Testing (Examination and Prescription) (No2) Regulations 1989, which specify the duties to be performed in a sight test. In the case of an NHS sight test, OMPs are additionally bound to the GOS regulations. This is the same regulative framework for optometrists (see therefore chapter 3.3.3.1 for a detailed analysis of the legislation). It is noteworthy that the status as an OMP is not necessary if the doctor only intends to conduct private sight tests [College of Optometrists, RCO 2011].

The Opticians Act allows doctors to sell and supply optical appliances and to fit contact lenses [Opticians Act 1989, sections 27 and 25]. It is unknown if and to what degree OMPs are involved in these activities. In general, it has to be stated that there is not much information available on the small group of ophthalmologists working as OMPs. Even the RCO [2004] concluded in 2004 that it is difficult to obtain accurate and up-to-date information about OMPs' professional practice.

3.3.4. Organisation of primary eye care

Primary eye care services in the UK are mainly provided in community optical practices. In almost all of the 7,250 optical practices in the UK, there are NHS-funded sight tests available, provided under GOS contracts that practices hold with local primary care organisations (PCTs in England) [Shah et al. 2007b; FODO 2010a]. Larger optical practices are typically staffed by an optometrist, a dispensing optician, one or two non-qualified assistants and perhaps two receptionists, whereas smaller practices are only staffed by an optometrist and one or two receptionists [Interview AOP 2011]. However, there is at least one optometrist, either a permanent or a locum [Interview ABDO College 2011].

Optometrists are the main providers of primary eye care in the UK [Shah et al. 2007a; QAA 2007]. In the year 2008-2009, more than 99 % of the 11.3 million NHS-funded sight tests in England were performed by optometrists and less than 1 % by OMPs. In addition, it is estimated that 5.2 million private sight tests were conducted in England [NHS IC 2009]. The number of sight tests for the entire UK was 19.9 million, including 14.1 million (71 %) NHS tests and approximately 5.8 million (29 %) private tests [FODO 2010a].

It is often the sight test that provides access to primary eye care for patients, and many people are eligible for sight tests funded by the NHS [AOP 2011a]. Table 8 lists the groups that qualify for an NHS sight test.

Table 8: NHS sight test entitlements in England, Wales and Northern Ireland

NHS sight test entitlements in England, Wales and Northern Ireland
- Children under 16 - People aged 16, 17 or 18 in full-time education - People aged 60 or above - Diagnosed glaucoma or diabetic patients - People at risk of glaucoma (as told by an ophthalmologist) - Close relatives aged 40 or above of diagnosed glaucoma patients - Registered blind or partially sighted - People eligible for an NHS Complex Lens Voucher - People claiming benefit (e.g., Income Support, Jobseeker's Allowance) - People on low income and named on an HC2 (full help) or HC3 (partial help) certificate

Source: Eye Health Alliance [2010]

In contrast, NHS eye examinations in Scotland (there is no 'sight test') are free to all [Eye Health Alliance 2010]. People who are not eligible for an NHS sight test are required to have a private sight test (which is often referred to as private eye examination), i.e., it has to be paid out of pocket by the patient. Private health insurances may reimburse the costs for a private sight test as well as for spectacles and contact lenses, but involvement of private health insurance in optometric services is small [Interview AOP 2011].

People are free to choose the optical practice where their sight will be tested. There is no registration required as is the case with the GPs [Blakeney 2009]. NHS sight tests always include symptoms and history taking, refraction, assessment of binocular vision and an external and internal examination of the eye. The optometrist or OMP in addition performs a visual field examination and a tonometry, if clinically indicated. At the least, these procedures also form part of a private sight test [Interview AOP 2011; AOP 2006].[75] The fee for a private sight test is on average £23.05 (26.78 €), but within a wide range of £10 (11.62 €) to £50 (58.09 €). In contrast, the fee that is paid by the NHS to the optical practice for performing an NHS sight test is £20.70 (24.05 €) in England, Wales and Northern Ireland. The actual costs for the provision of a sight test are considered to be more than twice as high as the average private fee. Costs for both private and NHS examinations are therefore significantly subsidized by the sale of spectacles [FODO 2010a].

If the patient requires new spectacles or contact lenses, he receives a prescription following the sight test. In addition, some people who have qualified for an NHS sight test also are given an NHS optical voucher. Table 9 shows the voucher entitlements, which are the same for the entire UK. As with the NHS sight test, the voucher can be redeemed at any practice of the patient's choice [Eye Health Alliance 2010]. Voucher values for spectacles range from £36.20 (42.06 €) to £200.10 (232.47 €). Although spectacles within these values are stocked by practices, many patients use the voucher only as partial payment, as they often choose more expensive spectacles [FODO 2010a].

[75] See chapter 3.3.3.1 for a detailed analysis of the legislation optometrists and OMPs must comply with when conducting a sight test.

Table 9: NHS optical voucher entitlements in the UK

NHS optical voucher entitlements in the UK
- Children under 16 - People aged 16, 17 or 18 in full-time education - People who are prescribed Complex Lenses - People claiming benefit (e.g., Income Support, Jobseeker's Allowance) - People on low income and named on an HC2 (full help) or HC3 (partial help) certificate

Source: Eye Health Alliance [2010]

The sale and supply of spectacles underwent significant changes in the course of the deregulation of the optical market in the 1980s. In 1984, the opticians'[76] monopoly over the sale of spectacles was broken up by the Health and Social Security Act 1984, permitting unregistered persons to sell spectacles to all, except to persons under the age of 16 and persons registered as partially sighted or blind, provided the sale is against a prescription less than two years old [Calver 2010; Bosanquet 2006].[77] Later on, the Health and Medicines Act 1988 allowed the over-the-counter sale of ready-made reading spectacles without a prescription [Bosanquet 2006; Davies et al. 2004]. In contrast to these 'deregulated' spectacles, which can be sold anywhere, 'regulated' spectacles, i.e., those for children under 16 years of age and the registered blind or partially sighted, can only be sold in optical practices; they have to be sold by or under the supervision[78] of a registered practitioner[79] [Interview ABDO College 2011; ABDO 2011f].

For the sale of powered contact lenses, there is a general requirement that the sale has to be conducted by or under the general direction[80] of a registered practitioner [GOC 2006]. 'General direction' sales are not permitted to persons under 16 years of age and visually impaired persons. Such sales require the 'supervision' of a registered practitioner. However,

[76] Here, the term 'opticians' covers both dispensing opticians and optometrists.
[77] The actual implementation was through 'The Sale of Optical Appliances Order of Council 1984', which provides for exemptions from the general rules of the Opticians Act.
[78] Supervision means that a registered practitioner must be on the premise and in a position to intervene when the supply takes place [ABDO 2011f].
[79] Registered practitioners here include optometrists, dispensing opticians and medical practitioners [GOC 2006].
[80] As opposed to sale under supervision, sale under general direction does not require the physical presence of a registered practitioner on the premise. Rather, it is sufficient for any unregistered seller to have a registered practitioner on the management team [Purslow 2010]. The registered practitioner is responsible that procedures are set in place to protect the patient, e.g., written protocols for the supply of contact lenses [ABDO 2011f].

any other person may purchase sight-correcting contact lenses under general direction from any supplier – in person, via mail or via the internet [Purslow 2010]. In order to buy powered contact lenses, the patient must provide a valid contact lens specification to the supplier. The patient is given such a specification on the completion of contact lens fitting by an optometrist, contact lens optician or medical practitioner [BCLA, GOC n.d.]. The fitting process, in turn, can only begin with the presentation of a valid spectacle prescription [Purslow 2010]. The fitting of contact lenses does not fall within an NHS sight test [ABDO et al. 2009].

The detection of signs constitutes the end of a sight test for both an NHS and a private sight test. In cases in which an optometrist determines that signs require referral, he must refer the patient to an appropriate practitioner [AOP 2010]. A survey from the College of Optometrists [2008] indicates that 3 to 5 % of patients are referred by their optometrists to their GPs, for example, for suspected diabetes or glaucoma, while 5 to 6 % of the patients are referred to an ophthalmologist, either directly or via their GP [College of Optometrists 2008]. Referrals to ophthalmologists (hospital-based) are mostly made via the patient's GP, who acts as a gatekeeper in the NHS to hospital specialist services. However, there is an increasing use of direct referrals. Patients with sight-threatening problems are always referred directly [Interview AOP 2011]. An overall lower referral rate than what was found in the College survey was indicated in a survey by FODO [2010a], according to which 4 % of patients are referred following a sight test to their GP or to a hospital.

In cases in which an optometrist detect equivocal signs in the patient's eye during a sight test, he may offer to perform further investigations, e.g., repetition of visual field tests or tonometry, in order to determine the referral requirement. In some areas, such 'enhanced services' are funded by the NHS, while in other areas, they are not. If there is no NHS funding scheme in place, it is the patient who is asked to pay for the additional tests privately. In the case that the patient is unable or unwilling to do so, he is referred by the optometrist, even with equivocal signs, rather than further managed in the optical practice [AOP 2010; Blakeney 2009].

The above described services are known as 'referral refinement'. However, there are much more enhanced primary eye care services offered by optometrists, e.g., monitoring of stable

glaucoma patients, pre- and post-operative cataract care, or treatment of minor eye conditions. It is perfectly obvious that the existence of enhanced primary eye care services has a strong influence on the organization of primary eye care. To put it simply, services that have been traditionally delivered as hospital-based outpatient services (secondary eye care) fall within the enhanced services provided by optometrists in community optical practices (primary eye care) [AOP 2008]. Consequently, the patient's pathway changes when local schemes are put into place that provide that GPs refer patients to an optometrist for the treatment of minor acute eye conditions, that ophthalmologists refer patients to an optometrists for follow-up care and final refraction after a cataract surgery or that optometrists refer patients directly to hospital-based ophthalmologists instead of first to the GP [Interview AOP 2011]. The development of enhanced service schemes has been fragmented, with many variations. There has been no systematic introduction; rather, development has proceeded "largely in isolation and in piecemeal fashion" [Bosanquet 2010]. A recent survey on the enhanced services activity by local optical committees in England showed that enhanced services are far from universal, albeit the number of enhanced services under discussion and commissioned by PCTs is increasing. Moreover, it has become apparent that the fees being paid by PCTs for enhanced services are inconsistent [Venerus 2010]. Its commissioning is at the discretion of every PCT and thus varies from PCT to PCT [Department of Health 2008a]. It is therefore difficult to draw a uniform picture of the organization of primary eye care in England beyond the core service of sight testing.[81]

3.3.5. Organization of secondary eye care

Secondary eye care is provided in hospitals by ophthalmologists, ophthalmic nurses, orthoptists and hospital-based optometrists [Bosanquet 2010]. Hospital Eye Services (HES) range from smaller departments located at district general hospitals and staffed by 2 to 4 consultant ophthalmologists up to teaching centres with 8 to 12 consultant ophthalmologists. Consultants are responsible for the training of junior doctors and oversee the work of staff

[81] The College of Optometrists has commissioned research on this issue: the UK Eye Care Services Survey is intended to give an overview of the current eye care pathways/eye-health delivery models across the UK. A map and directory of current pathways/delivery models will be produced to enhance what is currently insufficient information on the full range of such services. The review of how eye care is organised will comprise optometric and ophthalmological eye care [College of Optometrists 2011c].

and associate specialist (SAS) doctors [Bour 2003]. Especially in ophthalmic outpatient departments, there is a heavy reliance on the group of SAS ophthalmologists [RCO 2008].

Outpatient attendance at English NHS ophthalmology departments amounted to 5.95 million in the year 2009-10[82], of which 1.69 million (28 %) were first attendances [NHS IC 2010c; NHS IC 2010d]. Many patients attending outpatient departments require the follow-up of ongoing conditions [RCO 2009a]. According to NICE [2009], more than one million outpatient visits to the Hospital Eye Service are glaucoma-related each year. Special clinics may be held by consultant ophthalmologists who have specialized in a subspecialty, e.g., glaucoma, paediatric ophthalmology or oculoplastics [RCO n.d.]. Increasingly, non-medical staff, including ophthalmic nurses, orthoptists and hospital optometrists, are involved in certain outpatient activities, such as the management of cataract assessment or glaucoma-monitoring [RCO 2008].

Surgical procedures that may be performed by general ophthalmologists include cataract extraction, squint and glaucoma surgery and oculoplastic and nasolacrimal surgery. Despite the trend of concentrating on subspecialties, most consultants continue to perform cataract surgery [RCO 2009a]. In the year 2008-09, more than 300,000 cataract operations were performed in the English NHS [NHS IC 2011]. Surgery is also performed by SAS ophthalmologists in addition to their outpatient work [RCO 2009a].

[82] This refers to the NHS financial year from April 2009 to March 2010.

4. Criterion-based comparison of the primary eye care systems of France, Germany and the United Kingdom

Following the description of the three different primary eye care systems, this part of the study will assess the systems' performances in comparison to one another. First, we will analyse these systems along criteria concerning the structure, process, and outcomes of primary eye care (see chapter 4.1); then the focus will be set on financial and economic criteria (see chapter 4.2). The discussion of each criterion will be structured the same way. At first there will be a description of the objectives targeted at and the methods used. Afterwards the results will be presented. Finally limitations will be discussed and conclusions will be drawn.

4.1. Evaluation concerning structure, process and outcomes of primary eye care

In this chapter we will examine how the different organisation of primary eye care in the three target countries influences different aspects of care. To address this question, six criteria covering different aspects of structure, processes and outcomes of the three systems will be analysed. In detail the evaluation will encompass an assessment of the demographic development and the future need for ophthalmic care in the three countries (chapter 4.1.1), a description of the ratio of primary eye care providers to population (chapter 4.1.2) and the development of such figures over time (chapter 4.1.3) as well as an analysis of waiting times (chapter 4.1.4), aspects of consumer protection (chapter 4.1.5) and quality of care related issues (chapter 4.1.6).

4.1.1. Criterion 1: Demographic development and future need for ophthalmic care

(i) *Objectives and methods:*

This criterion aims to outline the future need for ophthalmic care in the three compared countries. As most eye diseases are age-related this need will be largely determined by the demographic development of the population. The chapter will therefore first focus on the

demographic changes the three countries are faced with in the next half-century, before future changes in the prevalence of ophthalmic diseases will be described. Finally there will be a short excursus on the consequences of the analysed developments on health related costs.

Data from national statistics offices (see Table 10) was collected to outline the demographic development in the targeted countries. In addition to details on the current age distribution, data also includes population projections over the next decades. To illustrate the demographic changes, data was classified by three selected age groups (< 20 years; 20-59 years; ≥ 60 years), once for the current population (2007 or 2008) and once for the projected population (2050 or 2051). In order to outline the future development of ophthalmic diseases, three studies were identified, carrying out projections of the absolute prevalence of ophthalmic diseases in the three targeted countries; each study covering one country. Table 10 summarizes the data used.

Table 10: Data acquisition for the population and ophthalmic diseases projections

Data acquisition for the population projections	
France	Insee - Institut national de la statistique et des études économiques [Blainpain, Chardon 2010]
Germany	Statistisches Bundesamt [2009b]
United Kingdom	ONS - Office for National Statistics [2009]
Data acquisition for the projections of ophthalmic diseases	
France	De Pouvourville et al. [2003]
Germany	Peters et al. [2010]
United Kingdom	Minassian, Reidy [2009]

Source: Institute for Health Care Management and Research

Although the following presentation of the results in tabular form might suggest a direct comparison between the three countries, this is not the primary intention of this criterion. Rather it is the intention to give a general impression of the demographic changes France, Germany and the UK are faced with and the changes in the prevalence of ophthalmic diseases this involves.

(ii) *Results:*

Table 11 gives an overview of the demographic development in France, Germany and the UK. France and the UK currently (2007 or 2008) draw a very similar picture. Both countries have a population of just over 60 million people, with about every fourth being younger than 20 years and just under 54 % falling in the age group of 20 - 59 years. People aged 60 years or above account for the smallest of the three selected age groups [Blanpain, Chardon 2010; own calculations based on ONS 2009]. Germany differs; on the one hand its population is about one third higher (82 million), on the other hand there are already more people aged 60 years and above (25.6 %) than aged under 20 years (19.0 %) [Statistisches Bundesamt 2009b].

Table 11: Demographic development in France, Germany and the UK

	France		Germany		UK	
Age group	**2007**	**2050**	**2008**	**2050**	**2008**	**2051**
< **20 years**	24.8%	22.3%	19.0%	15.4%	24.0%	21.6%
20-59 years	53.8%	45.9%	55.4%	44.4%	53.9%	48.1%
≥ **60 years**	21.5%	31.8%	25.6%	40.2%	22.1%	30.3%
Total population	61.8 million	72.3 million	82.0 million	69.4 million	61.4 million	77.1 million

Source: Blanpain, Chardon [2010]; Statistisches Bundesamt [2009b]; own calculations based on ONS [2009].

Long-term projections show that the population in all three countries is increasingly getting older. By mid of this century (2050 or 2051), the age group of 60 years and above is projected to increase to about 30 % in France and the UK, and even 40 % in Germany. This is accompanied by a decrease of the proportions of both other age groups (< 20 years and 20 - 59 years). While the ageing of the population is a major trend all three countries are faced with, an increase of the total population is only expected for France and the UK, with both populations rising to well over 70 million people by 2050 and 2051 respectively. In contrast, Germany's population is projected to decrease and fall below the number of 70

million by 2050 [Blanpain, Chardon 2010; own calculations based on ONS 2009; Statistisches Bundesamt 2009b].

Against the backdrop of the ageing of the population and in view of the age dependency of eye diseases, the following paragraph will take a look at the development of the absolute prevalence of selected ophthalmic diseases. Glaucoma, cataract, age-related macular degeneration (AMD), diabetic retinopathy and refractive error are considered as leading causes for partial sight and blindness [Access Economics 2009]. Table 12 shows estimated numbers of people affected by these five conditions by country.

Table 12: Development of the prevalence of ophthalmic diseases in France, Germany and the UK

	France		Germany		UK	
Prevalence (rounded to thousands)	**2000**	**2020**	**2007**	**2050**	**2010**	**2020**
Glaucoma	254,000 - 641,000[1]	344,000 - 887,000[1]	1,104,000	1,584,000	266,000[2]	327,000[2]
Cataract	3,436,000 - 5,635,000	4,770,000 - 7,602,000	n.a.	n.a.	n.a.	n.a
AMD	358,000[3]	537,000[3]	875,000	1,769,000	1,494,000[4]	1,821,000[4]
					415,000[5]	516,000[5]
					194,000[6]	240,000[6]
Diabetic retinopathy	385,000 - 737,000[7]	498,000 - 955,000[7]	n.a.	n.a.	748,000[9]	938,000[9]
					66,000[10]	83,000[10]
	66,000 - 76,000[8]	85,000 - 99,000[8]			19,000[11]	24,000[11]
					188,000[12]	236,000[12]
Refractive error	30,540,000	35,526,000	n.a.	n.a.	n.a.	n.a.

[1] Data refers to chronic open angle glaucoma. [2] Data refers to persons with diagnosed (detected) primary open angle glaucoma. [3] Data refers to advanced stages of AMD (dry or atrophic and neovascular AMD). [4] Data refers to early AMD. [5] Data refers to neovascular AMD. [6] Data refers to geographic atrophy (dry AMD). [7] Data refers to diabetic retinopathy in general. [8] Data refers to proliferative diabetic retinopathy. [9] Data refers to background diabetic retinopathy. [10] Data refers to non-proliferative diabetic retinopathy. [11] Data refers to proliferative diabetic retinopathy. [12] Data refers to diabetic maculopathy.

Source: De Pouvourville et al. [2003]; Peters et al. [2010]; Minassian, Reidy [2009].

Data about France is from de Pouvourville et al. [2003], which estimate the number of people affected by all five selected conditions in 2000 and 2020, drawing on population projections from the national statistics office and prevalence rates from national and international studies. As they often use ranges of prevalence rates, calculated prevalences show also wide ranges. However, regarding the results from de Pouvourville et al. shown in

Table 12 the trend is obvious: the prevalence of all five conditions is going to increase considerably over the projected period 2000 to 2020. The prevalence of refractive errors is expected to increase by about 16 % to 35.5 million by 2020. While cases of diabetic retinopathy are projected to rise by about 30 %, glaucoma and cataract are estimated to increase somewhat stronger (35 % - 39 %). The number of people suffering AMD will even increase by 50 % and amount to more than half a million people by 2020. Interestingly, the report from de Pouvourville et al. includes also prevalence rates by age groups showing that all five conditions are heavily age related: all prevalence rates increase with age.[83]

An approach similar to de Pouvourville et al. [2003] is used by Peters et al. [2010] to estimate the prevalence of glaucoma and AMD among the German population. According to their results, the number of glaucoma sufferers will rise from 1.1 million in 2007 to just under 1.6 million by 2050. The number of people affected by AMD will even double within this period – a period that is also characterized by a decrease in the total population [Peters et al. 2010]. Although they do not analyse diabetic retinopathy, Peters et al. [2010] include diabetes in their projections, according to which the number of diabetes sufferers is going to rise from 4.1 - 6.4 million in 2007 to 5.8 - 7.8 million by 2050. Taking into account results from a recent study from Sweden [Heintz et al. 2010] that almost 30 % of diabetics show signs of a diabetic retinopathy, Germany's eye care system is probably faced with a vast and increasing number of patients suffering from diabetic retinopathy. In addition, the numbers of about 600,000 cataract surgeries performed annually in Germany [BVA 2011a] as well as 39.2 million adults plus 1.6 million children wearing spectacles to correct refractive errors [Institut für Demoskopie Allensbach 2008] give some indications of the current burden the German health care system has to cope with.

Figures for the UK shown in Table 12 are from a report by Minassian and Reidy [2009]. Prevalence data used in their complex epidemiological estimates is derived from national and international studies or meta-analysis of such studies. For the decade 2010 to 2020, they estimate increases of the prevalence of glaucoma, AMD and diabetic retinopathy between approximately 20 % and 25 %. Although the report distinguishes between different subtypes or stages of AMD and diabetic retinopathy, it does not contain prevalence estimates for

[83] De Pouvourville et al. [2003] do not provide prevalence rates by age for diabetic retinopathy but only for diabetic in general. These rates are also increasing with age, except for the group of people aged 80 and above.

cataract and refractive error. However, the number of cataract operations is estimated to be 389,000 in 2010 for the UK and projected to increase to 474,000 in 2020 [Minassian, Reidy 2009]. A general impression regarding the prevalence of refractive errors is given by FODO [2010a], which indicate with reference to the Health Survey for England, 2001, that 68 % of the adult population aged 16 and above wear spectacles or contact lenses.

Excursus:

Impact of the future need for ophthalmic care on health-related costs

The evaluated development of eye conditions against the background of the demographic development in the targeted countries does not only challenge the underlying primary eye care systems with regard to medical needs, but is also a factor regarding health-related costs. The purpose of this brief excursus is not to estimate the actual prospectively accruing costs, but to convey an understanding of the financial resources necessary for the treatment of the different eye conditions from the systems' perspectives. An estimation of the actually accruing costs would be very limited with respect to varying study populations of the identified prevalence- and cost-studies as well as diverse underlying cost-parameters (direct or non-direct medical or non-medical costs). Furthermore, there would have been a range of simplifying assumptions regarding measures of therapy, severity of the diseases or time horizons. In addition there is the fact, that the treatment of the regarded eye conditions is associated with "secondary eye care". Thus, a more detailed analysis would be beyond the scope of this study.

The following table gives an impression of cost-related data on the selected ophthalmic diseases, supplemented by a study on health-related costs of visual impairment [Lafuma et al. 2006a]. The presented studies were identified in the systematic literature search (as described in chapter 2). All studies dating back no longer than 2000 have been included.

Table 13: Health-related costs of selected ophthalmic diseases in France, Germany and the UK

Survey	Eye disease	Determined costs	Included parameters
Bonastre et al. [2002]	AMD	Unit costs per patient/year of AMD management amount up to: - 10,668 € in France - 12,289 € in Germany - 13,073 € in the UK	Costs of diagnosis Costs of PDT[1] (including drug costs) Costs of photocoagulation Costs of low vision rehabilitation Costs of vision aids
Schrader [2006]	AMD	Treatment costs (Germany); depending on therapy: - 2-years PDT therapy: 6,500 € - 12,500 € - 2-years Pegaptanib therapy: ~19,000 € - 4-times Macugen-injection + PDT: ~8,000 €	Therapy costs (including drug costs) Costs of follow-up diagnosis
Cruess et al. [2008]	NV-AMD[2]	Mean annual direct vision-related medical costs per patient with bilateral neovascular AMD (NV-AMD): - 3,396 € in France - 2,870 € in Germany - 2,152 € in the UK Mean annual total costs per patient with NV-AMD: - 7,348 € in France - 12,445 € in Germany - 5,299 € in the UK	Direct vision-related medical costs Direct non-vision-related medical costs Direct non-medical-related costs
Traverso et al. [2005]	Glaucoma	Direct health care costs of glaucoma treatment per person by stage of the disease: - 414 € - 1002 € in France - 814 € - 1,194 € in Germany - 457 € - 1,065 € in the UK	Office visits Glaucoma exams Visual fields Glaucoma surgeries Cataract extractions Medications
Grüb, Rohrbach [2006]	Glaucoma	Annual costs per patient by German statutory health insurances: - ~ 1,000 € per glaucoma patient - plus annual payments of 150 million € disability benefits for the blind	Costs of diagnosis Costs of therapy (including drug costs) Blindness-related costs
Poulsen et al. [2006]	Glaucoma	Total annual costs per patient due to glaucoma-related blindness (last stages of glaucoma progression): - In average 16,996 € - Range from 11,758 € to 19,111 €	Direct treatment costs (including drug costs) Rehabilitation costs Loss of productivity Patient and family costs
Happich et al. [2008]	Diabetic retinopathy	Annual costs per patient for diabetic retinopathy from the societal perspective: - 1,433 € in Germany	Medical devices Hospitalisation Ophthalmologists and other physicians fees Rehabilitation costs Drug costs Temporary working disability Etc.
Smith et al. [2009]	Refractive errors	Productivity loss due to uncorrected refractive errors: - ~50 billion I$ in Europe (Adjusted GDP loss; international Dollars)	
Lafuma et al. [2006a]	Visual Impairment	Non-medical costs associated with visual impairment (per patient/year): - 8,434 € in France - 12,662 € in Germany - 13,674 € in the UK	Institution modifications Loss of income Devices Paid assistance Etc.

[1] PDT = Photodynamic therapy. [2] NV-AMD = Neovascular AMD.

Source: Institute for Health Care Management and Research

(iii) *Limitations:*

The presented results are subject to the following limitations.

- *Demographic development*

Data for the demographic development was extracted from population projections of the national statistics offices of the three countries (see Table 10). All offices publish several versions of projections, varying in underlying assumptions about fertility, life expectancy and net migration. Presented results (Table 11) are based on the versions 'scenario central' (scénario central) for France [Blanpain, Chardon 2010], 'principal projection' for the UK [ONS 2009] and 'minimum level of mid population' (Untergrenze der mittleren Bevölkerung) for Germany [Statistisches Bundesamt 2009b]. It remains uncertain to what extent the underlying assumptions of the three used versions will be met in the future and whether alternative versions would have proved better.

- *Development of the prevalence of ophthalmic diseases*

Data for the development of the prevalence of ophthalmic diseases (see Table 12) was extracted from three studies, each dealing with one country (see Table 10). This data is unsuitable for a comparison with each other for several reasons, including differences in the projected period as well as covered diseases. In addition, studies partially focus on different subtypes of diseases (see the footnotes of Table 12) or do not specify to which subtype stated prevalence refers to (e.g. Germany data). In some cases, the prevalence is calculated based on prevalence data from international studies (e.g. AMD for France), as there is a lack on national data. With regard to some of the stated prevalences, there is evidence of underestimation or overestimation. For example according to Bour and Corre [2006], there have already been at least one million glaucoma patients in France in 2005, thus more than the maximum number of 887,000 estimated by de Pouvourville et al. [2003] for the year 2020. Bour and Corre [2006] also state with regard to the cataract prevalence of 3.4 - 5.6 million in 2000 indicated by de Pouvourville et al. [2003] that this number can be reduced by at least half. (Nonetheless, cataract surgery is considered to be the most frequent intervention in France with more than 400,000 surgeries performed each year [Brézin 2006]. Cimberle [2011] even indicates the annual number of 750,000 cataract surgeries in France.) Taking into account these limitations, the presented results should be regarded only isolated for each country and only as a general impression of the future development of the demand for ophthalmic care.

(iv) Conclusions:

Despite limitations, mainly affecting the comparability between the three countries, the results paint a clear picture: against the background of an ageing of their populations and in view of the fact that the main eye diseases are age related, all three countries are faced with an increasing demand for ophthalmic care.

Except for refractive errors, which mainly fall within the area of responsibility of primary eye care, the treatment of the above analyzed conditions (e.g. the surgery of cataract) is part of secondary eye care, which is not the focus of this study. Nevertheless, the detection of signs of these conditions is an important function of primary eye care providers as the early detection of many eye diseases will prevent or reduce the progress of the disease. This may relieve the burden from secondary eye care providers and reduce costs associated with eye disease; in addition to direct costs for its management, eye disease result in indirect costs of productivity loss. Against the background of the projected prevalences, the role of primary eye care providers become more and more important.

4.1.2. Criterion 2: Ratio of primary eye care providers to population

(i) Objectives and methods:

Lafuma et al. [2006b] determined an inverse correlation between the number of ophthalmologists/population and the prevalence of low vision in given areas in France. The published data suggests that a high density of eye care providers could be one of the drivers of good vision. Against that background the purpose of this criterion is to analyse the ratio of the different eye care providers (ophthalmologists, optometrists and opticians) to population in France, Germany and the UK. Therefore we evaluated the number of providers and outlined the share of eye care professionals per 100,000 population as well as the regional distribution of providers throughout the three countries.

To obtain information concerning the numbers of primary eye care providers in the targeted countries basically national statistics were utilized. In all three countries eye care providers have to register when obtaining market access. A more complex but limited method was

used to accurately display the total number of German dispensing opticians and optometrists. Only the total number of all people working in the opticians' branch is published by the ZVA. Based on different registration requirement in the analysed countries a more explicit market segmentation of German dispensing opticians and optometrists is not possible. The German register of qualified craftsmen (*Handwerksrolle*) accounts the number of premises performing opticians' services in the respective region, but not the number of professionals. Therefore, to determine the numbers of dispensing opticians and optometrists in Germany the number of opticians' premises was multiplied with the average number of performing dispensing opticians and optometrists per shop. This data was evaluated in a structural analysis of the opticians' branch published by Schmitz [2007]. A detailed representation of the national statistical institutions that were consulted for data acquisition is shown in the following table.

Table 14: References for the data acquisition of the numbers of primary eye care providers

References for the data acquisition of the numbers of primary eye care providers	
France	
Ophthalmologist	Conseil National de l'Ordre des Médecins
	Direction de la recherche, des études, de l'évaluation et des statistiques
Opticians	Direction de la recherche, des études, de l'évaluation et des statistiques
Stores	Haute Autorité de Santé
Germany	
Ophthalmologists	Bundesärztekammer
	Kassenärztliche Bundesvereinigung
	Bewertungsausschuss Ärzte
Dispensing opticians	ZVA Branchenbericht
	Zentralverband des deutschen Handwerks
Optometrists	ZVA Branchenbericht
	Zentralverband des deutschen Handwerks
Stores	ZVA Branchenbericht
	Zentralverband des deutschen Handwerks
Practices	Statistisches Bundesamt
UK	
Dispensing opticians	General Optical Council
Optometrists	The NHS Information Centre
	General Optical Council
	Performer lists of the primary care trusts
OMP	Federation of ophthalmic and dispensing opticians
Stores	Spectaris

Source: Institute for Health Care Management and Research

(ii) *Results:*

Table 15 shows a comprehensive overview of the numbers of the primary eye care providers in the compared countries. According to the latest statistics, the total number of primary eye care providers is the largest in Germany. Approximately 38,000 professionals perform services in Germany compared to approximately 24,000 in France and 18,000 in the UK. This relation applies to the headcount of professionals as well as the number of professionals per 100,000 population (GER: ~45/100,000; FR: ~39/100,000; UK: ~30/100,000) [Sicart 2009a; Sicart 2009b; ZDH 2010a; BÄK 2010; GOC 2010a; NHS IC 2010b; FODO 2010a]. But a simple juxtaposition of the number of eye care professionals does not adequately portray the primary eye care provision situation. A more sophisticated consideration is necessary.

Table 15: Number of eye care professionals

		Number (Headcount)	Number per 100,000 population	Number of stores/practices	Number of stores/practices per 100,000 population
France	**Opticians**	19.575	31,17	~10.520	~16,75
	Ophthalmologists	4.657	7,42	n.a.	n.a.
Germany	**Dispensing opticians**	~17.250	~21,09	10.149	12,26
	Optometrists[1]	~15.200	~18,61		
	Ophthalmologists	5.626	6,88	~3.600	~4,40
UK	**Dispensing opticians**	5.655	9,15	7.251	11,74
	Optometrists	11.954	19,35		
	OMP	396	0,64		

[1] Number refers to those *Augenoptiker*, who have succesfully completed the *Augenoptikermeister* examinations. Please consider the restrictions of the designation as optometrists mentioned in chapter 3.2.2.2.

Source: Sicart [2009a]; Sicart [2009b]; BÄK [2010]; L'Opticien Lunetier [2010a]; ZDH [2010a]; Statistisches Bundesamt [2009a]; GOC [2010a]; Spectaris [2010]; NHS IC [2010b]; FODO [2010a]; Own calculations based on Schmitz [2007] and ZDH [2010a]

Taking into account the training routes, competencies and ranges of activities performed by the different professions, the situation can be outlined as follows. In Germany and France the actual primary eye care providers are the ophthalmologists, in contrast to the UK, where services are predominantly performed by optometrists and ophthalmic medical practitioners. These professionals obtain adequate medical knowledge during their education and have at their disposal the respective legal competencies to perform the whole range of primary eye care services. Thus about 20 professionals per 100,000 population in the UK face only about 7 professionals per 100,000 population in France and Germany. Against the background that German optometrists are authorised and capable to assume responsibility for essential tasks in primary eye care, these professionals might be added to the number of primary eye care providers as well. Accordingly the number of German primary eye care providers would increase to approximately 25 per 100,000 population. In France almost exclusively ophthalmologists provide services in primary eye care. Patients do not have direct access to an orthoptist and the French optician is, regarding his legal competencies, his education and his scope of practice not a primary eye care provider in the proper meaning of the expression. His main focus is the sale of optical appliances and not the performance of eye care. Consequently the French optician is more comparable to German and British dispensing opticians than to optometrists or ophthalmologists. At best, the approximately 2,000-3,000 (i.e. 3.18-4.78 professionals per 100,000 population) "optometrists" practicing in France might be added to the number of primary care providers. Thus the French system would account a maximum of 12 primary eye care providers per 100,000 population. This number would signify almost the half of primary eye care providers in comparison to Germany (25/100,000) and the UK (20/100,000).

In contrast the French system shows the largest number of dispensing opticians practicing in the market. Whereas in France there are more than 30 dispensing opticians per 100,000 population, in Germany there are only about 21 per 100,000 and the UK gets along with less than 10 dispensing opticians per 100,000 population [Sicart 2009b; ZDH 2010a; Schmitz 2007; GOC 2010a]. Albeit, in this case it has to be reconsidered, that German and British optometrists are entitled to perform dispensing opticians' services as well. Also the number of opticians' stores is quite comparable between the three countries with 11.74 stores per 100,000 population in the UK, 12.26 in Germany and 16.75 in France [ZDH 2010a;

L'Opticien Lunetier 2010; Spectaris 2010]. Therefore the main difference regarding the dispensing opticians seems to be the numeric staffing of opticians' premises.

The comparison of the number of opticians' stores and ophthalmologists' practices will not be specified in detail at this point. This is owed to the facts, that on the one hand it was not possible to evaluate the number of ophthalmologists' practices in France and UK[84] and on the other hand that the services delivered in opticians' premises cannot be compared between the targeted countries. Whereas in France usually opticians' premises are only appropriate for the sale of optical appliances, in Germany and the UK there are also premises offering only optometric services or mixed activities.

In the following paragraphs an evaluation of the distribution of the eye care professionals on regional level will be shown. The analysis of the figures on regional level is based on different levels of aggregation, which leads to a more difficult and restricted comparison (see also "limitations" later in this chapter). Nevertheless it will be assessed, if at least a significant trend regarding the distribution of primary eye care providers is noticeable.

[84] A differentiation between opticians' premises, optometrists' premises and OMP premises in UK was not possible.

Table 16: Regional comparison of French primary eye care providers

Region	Population	Opticians		Ophthalmologists	
		Headcount	Per 100,000	Headcount	Per 100,000
Alsace	1.855.989	523	28,18	128	6,90
Aquitaine	3.227.433	754	23,36	278	8,61
Auvergne	1.345.441	292	21,70	97	7,21
Lower Normandie	1.473.789	428	29,04	89	6,04
Burgundy	1.642.757	514	31,29	90	5,48
Brittany	3.195.317	1.097	34,33	213	6,67
Centre	2.545.399	675	26,52	138	5,42
Champagne Ardenne	1.334.117	301	22,56	67	5,02
Corse	310.763	72	23,17	20	6,44
Franche-Comté	1.173.270	378	32,22	54	4,60
Upper Normandie	1.833.456	479	26,13	110	6,00
Ile-de-France	11.798.427	4.572	38,75	1.180	10,00
Languedoc-Roussillon	2.632.671	759	28,83	221	8,39
Limousin	745.893	185	24,80	37	4,96
Lorraine	2.350.209	723	30,76	137	5,83
Midi-Pyrenées	2.892.893	898	31,04	210	7,26
Nord-Pas-de-Calais	4.025.605	1.320	32,79	200	4,97
Pays de la Loire	3.565.322	1.093	30,66	227	6,37
Picardy	1.913.689	509	26,60	95	4,96
Poitou Charentes	1.773.541	541	30,50	101	5,69
Provence-Alpes-Côte d'Azur	4.951.388	1.480	29,89	521	10,52
Rhône-Alpes	6.211.811	1.982	31,91	444	7,15
France (Métropolitaine)	62.799.180	19.575	31,17	4.657	7,42

Source: Sicart [2009a]; Sicart [2009b]; INSEE [2010]

Table 16 presents the allocation of eye care providers throughout the French regions. It shows a non-uniform distribution of ophthalmologists on regional level, with ten or more professionals per 100,000 population in Ile-de-France and Provence-Alpes-Côte d'Azur and less than five professionals per 100,000 population in Franche-Comté, Limousin, Nord-Pas-de-Calais and Picardy [Sicart 2009a; Sicart 2009b]. That means a variation of more than

100 % between most and the least frequented regions. This tendency is even strengthened looking at the local level, e.g. with more than 26 professionals per 100,000 population performing in the Greater area of Paris and only about three practitioners in Ardèche [Le Breton-Lerouvillois 2009].

The distribution of opticians throughout the country is more uniform, although it shows a large variation as well. The minimum of 21.7 opticians per 100,000 population in Auvergne faces a maximum of almost 39 professionals per 100,000 population in Ile-de-France. That means a variation of almost 80 %.

In comparison Germany shows a homogeneous allocation of all primary eye care providers throughout the country (see Table 17). The analysis focuses on the regional distribution of primary eye care providers in the sixteen Federal States. In case of the German ophthalmologists, due to restrictions in the availability of data, the analysis is made on statistics of the National Association of Statutory Health Insurance Physicians (KBV) about the independent office based practitioners, meaning without employed primary eye care providers. It can be recognized that the number of German ophthalmologists varies between 5.59 per 100,000 population in Lower Saxony and 8.61 per 100,000 population in Bremen [KBV 2010a]. That is a variation of less than 55 %. Nevertheless, there might be regional bottlenecks in the provision of services as Kopetsch [2010] recorded almost 100 areas (counties) free for accreditation as ophthalmologist in Germany at the beginning of 2010. As this might be dedicated to a plethora of reasons a more detailed analysis is not possible at this point.

German optometrists show a relatively homogenous distribution, with a range from 14.20 per 100,000 population in Hamburg to 22.59 per 100,000 population in Saarland (i.e. a variation of ca. 60 %) [ZDH 2010a; Schmitz 2007]. The same applies for German dispensing opticians, measuring between 16.10 per 100,000 population in Hamburg and 25.60 per 100,000 population in Saarland. In this context it has to be mentioned that there might be inaccuracies in the presented results due to non-uniform methods of registration in the German register for qualified craftsmen (see limitations). Especially Hamburg is deemed to be a Federal State with a high density of dispensing opticians and optometrists due to the fact that the headquarters and several outlets of the Fielmann Company are located there.

Table 17: Regional comparison of German primary eye care providers

Region	Population	Dispensing opticians		Optometrists[1]		Ophthalmologists	
		Headcount	Per 100,000	Headcount	Per 100,000	Headcount	Per 100,000
Baden-Württemberg	10.744.921	2.344	21,82	2.069	19,25	624	5,81
Bavaria	12.510.331	3.011	24,07	2.657	21,23	811	6,48
Berlin	3.442.675	592	17,18	522	15,16	290	8,42
Brandenburg	2.511.525	447	17,80	395	15,71	146	5,81
Bremen	661.716	162	24,41	143	21,53	57	8,61
Hamburg	1.774.224	286	16,10	252	14,20	148	8,34
Hesse	6.061.951	1.357	22,38	1.197	19,75	372	6,14
Mecklenburg-Vorpommern	1.651.216	274	16,58	242	14,63	109	6,60
Lower Saxony	7.928.815	1.726	21,76	1.523	19,20	443	5,59
North Rhine-Westphalia	17.872.763	3.715	20,78	3.278	18,34	1.108	6,20
Rhineland-Palatinate	4.012.675	870	21,69	768	19,14	228	5,68
Saarland	1.022.585	262	25,60	231	22,59	68	6,65
Saxony	4.168.732	835	20,02	737	17,67	262	6,28
Saxony-Anhalt	2.356.219	403	17,10	356	15,09	160	6,79
Schleswig-Holstein	2.832.027	530	18,73	468	16,53	170	6,00
Thuringia	2.249.882	442	19,65	390	17,33	147	6,53
Germany	81.802.257	17.253	21,09	15.224	18,61	5.143	6,29

[1] Number refers to those *Augenoptiker*, who have succesfully completed the *Augenoptikermeister* examinations. Please consider the restrictions of the designation as optometrists mentioned in chapter 3.2.2.2.

Source: Own calculations based on ZDH [2010a]; KBV [2010a]; Statistische Ämter des Bundes und der Länder [2011]

For the analysis of the regional allocation of British primary eye care providers this study focuses on the four different UK countries England, Scotland, Wales and Northern Ireland. Regarding the English optometrists and Ophthalmic Medical Practitioner a more detailed analysis on the level of the Strategic Health Authorities (SHAs) was also possible. However, the local analysis bases on data from the NHS [NHS IC 2010b] and not of the GOC [GOC 2010a], so that there is a discrepancy between the statistics of 50 optometrists. The results are shown in Table 18.

The British optometrists show uniformity in their distribution between the four countries of the UK. The variation amounts to approximately 50 % with a range from 18.77 per 100,000 population in England to 28.45 optometrists per 100,000 population in Northern Ireland [GOC 2010a]. Looking at the local numbers – i.e. the SHAs in England – the British optometrist show an almost homogeneous allocation, with a variation less than 35 % between London (21.28 optometrists per 100,000 population) and the East Midlands (15.77 optometrists per 100,000 population) [NHS IC 2010b].

The few Ophthalmic Medical Practitioners performing primary eye care services in the British system are spread throughout the country with a maximum of 87 in the SHA of London. Between 0.19 and 1.23 OMPs per 100,000 population are practicing in the four UK countries. Whereas Northern Ireland shows the largest numbers of optometrists and OMPs the number of dispensing opticians is significantly low with less than three practitioners per 100,000 population in contrast to almost ten in England [FODO 2010a; NHS IC 2010b].

Table 18: Regional comparison of British primary eye care providers

Region		Population	Dispensing opticians		Optometrists		OMP	
			Headcount	Per 100,000 population	Headcount	Per 100,000 population	Headcount	Per 100,000 population
Strategic Health Authorities (England)	North East England	2.584.300	n.a.	n.a.	429	16,60	8	0,31
	North West	6.897.900	n.a.	n.a.	1.253	18,16	36	0,52
	Yorkshire and the Humber	5.258.100	n.a.	n.a.	1.000	19,02	25	0,48
	East Midlands	4.451.200	n.a.	n.a.	702	15,77	27	0,61
	West Midlands	5.431.100	n.a.	n.a.	1.082	19,92	32	0,59
	East of England	5.766.600	n.a.	n.a.	984	17,06	50	0,87
	London	7.753.600	n.a.	n.a.	1.650	21,28	87	1,12
	South East Coast	4.340.300	n.a.	n.a.	789	18,18	42	0,97
	South Central	4.095.400	n.a.	n.a.	792	19,34	17	0,42
	South West	5.231.200	n.a.	n.a.	998	19,08	17	0,32
England (NHS)[1]		51.809.700	n.a.	n.a.	9.679	18,68	341	0,66
England (GOC)		51.809.700	5.082	9,81	9.724	18,77	n.a.	n.a.
Wales		2.999.300	193	6,43	564	18,80	23	0,77
Scotland		5.194.000	327	6,30	1.157	22,28	10	0,19
Northern Ireland		1.788.900	53	2,96	509	28,45	22	1,23
United Kingdom		61.792.000	5.655	9,15	11.954	19,35	396	0,64

[1] The numbers of optometrists in the SHAs of England base on statistics of the NHS and differ from the GOC statistics (9,679 vs 9,724).

Source: FODO [2010a]; NHS IC [2010b]; GOC [2010a]; ONS [2010b]

(iii) Limitations:

The validity of the presented results is restricted due to basically five different reasons:

- *Discrepancy of statistics:*

The presented numbers of the eye care professionals vary significantly between different national databases, due to different methods of data acquisition. As an example: the number of French ophthalmologists according to the DREES is 5,567 [Sicart 2009b] whereas the National Medical Council accounts only 5,215 ophthalmologists [Le Breton-Lerouvillois 2009].[85] Theses discrepancies occur for almost every profession in the countries of comparison. Thus the exact number of performing eye care providers seems to be difficult

[85] For more information about the methods of data acquisition of these statistics see also HAS [2011].

to determine even for national statistical institutions. This study uses the obtainable information and focuses for each profession on one of the available statistics.

- *Statistics about the German opticians:*

As mentioned before, the exact number of dispensing opticians and optometrists practicing in Germany was not available. The projections are based on a branch analysis dating from 2007 [Schmitz 2007] and are confirmed by the results of the different expert interviews about the German eye care system. Nevertheless, in contrast to the presented figures of the other eye care providers in all targeted countries, the numbers of German opticians are only estimations and not precise. As an example: The number of apprentices currently practicing in the German optician's market would have been about 4,760 according to our projections. In contrast, official data of the central chamber of handicraft accounts 6,470 apprentices in 2009 [ZDH 2010b]. The number of opticians' stores seems to be inaccurate as well due to non-uniform measures of registration depending on the respective regional chamber of handicraft. Official data of the ZDH accounts 10,149 stores whereas the ZVA estimates the number to be approximately 11,900 [Spectaris 2010]. Thus significant deviations of the numbers might be possible.

- *No full-time equivalents:*

The presented numbers are headcounts and no full-time equivalents. These would display the workforce of the different primary eye care providers more accurately. It is relevant taking into consideration that all professions have a high feminization rate, which is an indication for many part-time workers. Also a mixture of primary and secondary eye care activities of the French ophthalmologists is not uncommon. Unfortunately statistics about full-time equivalents were not available, thus this analysis is limited to headcounts.

- *Aggregation level of the regional comparison:*

The regional comparison is based on different levels of aggregation, regarding, e.g. the geographical extension or the number of inhabitants of a respective area. A uniform definition of "regional" and "local" was not achievable, because data was only available to a limited extent. Consequently, an accurate comparison of regional figures was not possible and only trends could be indicated.

- *Different professions:*

A comparison of the numbers of the different primary eye care providers is also restricted in its validity due to the differences in education, competencies and scope of practice as describes in chapter 3. For instance the British optometrist has more competencies than his

German counterpart, but less than the German ophthalmologist. Another example is that the British and German dispensing opticians might be comparable concerning their scope of practice, but the German dispensing optician is not entitled to run an optician's premise on his own. Thus an accurate comparison of the numbers is only possible to a limited extent.

(iv) *Conclusions:*

Due to the limitations mentioned, the results of this comparison are restricted in their validity. Nevertheless it is conspicuous, that the French system shows a significantly smaller number of primary eye care providers than Germany and the UK. Additionally to the small number of primary eye care providers, France seems to exhibit the largest heterogeneity regarding the distribution of professionals throughout the country. On the other hand the number of opticians in France is significantly higher than average. Considering that French opticians focus primarily on the sale of optical appliances and not optometric services, there seems to be a trend towards oversupply. This hypothesis is supported by the fact that there are first legal initiatives to control the distribution of opticians in France [Acuité 2011b]. Moreover in France there is an unemployment rate of of opticians of approximately 5 %, compared to less than 2 % in Germany and nearly full employment in the UK [Interview AOF 2010; Interview ABDO College 2011; ZVA 2011b]. Oversupply of French opticians is just a recognisable fact, but not a real problem for the eye care system, due to the fact, that French opticians are not capable of introducing measures of supply-induced demand. Thus oversupply will normally be regulated by market forces.

The German and the British system seem to exhibit a considerably larger uniformity regarding the distribution of professionals compared to France. Despite the fact, that the construction of systems is completely different, the number of primary eye care providers is comparable between Germany and the UK, with 25 respectively 20 professionals per 100,000 population. Nevertheless it has to be reconsidered, that the German system would face an even smaller number of primary eye care providers than France, if optometrists would not take over essential tasks in primary eye care. A significant difference between the British and the German system is the number of dispensing opticians. The British system gets along with much less practitioners than the German system, with a comparable number of

opticians' premises. However, the ABDO College in the UK records first signs of an increasing shortage of dispensing opticians [Interview ABDO College 2011].

4.1.3. Criterion 3: Development of figures of primary eye care providers

(i) *Objectives and methods:*

The last criterion dealt with the "Ratio of primary eye care providers to population". Based on this, there will be a detailed analysis of these figures regarding past and future development. This analysis includes the description of the development of the figures in the recent years, an evaluation of retirements and graduations as well as a description of the age structure of the different professions.

The required information for this criterion was generated by the national statistical institutions of the compared countries as well as the professional associations of the different eye care professions. The information was confirmed by expert- interviews about the organization of the different primary eye care systems. Finally the search method was completed with a systematic literature research. Especially for the French and German ophthalmologists adequate studies were found, which focus on the future development of figures of ophthalmologists.

(ii) *Results:*

Table 19 demonstrates that in Germany and France the age structure of the medical specialists exceeds the ones of the opticians. Whereas in these two countries half of all professionals in the opticians' market is less than 34 years old [IAB 2009; Sicart 2009b], the situation of the ophthalmologists is completely different. Only about 15 % (11.3 % in France and 14.5 % in Germany) are younger than 34 years. In Germany nearly half of all ophthalmologists is 50 years or older. In France even more than 67 % exceed this mark.

These tendencies are confirmed by an average age of 37.9 years for the French opticians and more than 50 years for the French and German ophthalmologists [BÄK 2010; Sicart 2009a]. It is predictable that in the next few years an increased number of ophthalmologists'

retirements will be recognisable. Currently the number lies between 80 and 100 each year in France and approximately 190 in Germany [Bour, Chorre 2006; Kopetsch 2010]. So far, the number of retiring ophthalmologists was covered or even exceeded by the number of new ophthalmologists accessing the market. In Germany in average about 230 young ophthalmologists complete education and get access to the eye care scheme every year. This statistic is confirmed regarding the development of the figures in the past 10 years, where an increased number of practitioners can be stated. The increase was about 6.6 % since 2000, which means an additional headcount of 420 physicians in primary eye care [BÄK 2010].

Table 19: Demographic development of eye care professionals

	France		Germany			UK		
	Opticians	Ophthalmologists	Dispensing opticians	Optometrists[1]	Ophthalmologists	Dispensing opticians	Optometrists	OMP
Headcount:	19.575	5.567 (incl. secondary eye care)	~17.250	~15.200	6.756 (incl. secondary eye care)	5.655	11.954	396
Age structure:	**<34 years:** 50,6%	**<34 years:** 5,2%	**<34 years:** 49,0%		**<34 years:** 3,8%	**<25 years:** 3,0%	**<25 years:** 6,0%	n.a.
	35-39 years: 15,2%	**35-39 years:** 6,1%	**35-49 years:** 35,9%		**35-39 years:** 10,7%	**25-39 years:** 42,0%	**25-39 years:** 48,0%	n.a.
	40-49 years: 15,8%	**40-49 years:** 20,1%			**40-49 years:** 35,5%	**40-54 years:** 41,0%	**40-54 years:** 32,0%	n.a.
	50-59 years: 9,8%	**50-59 years:** 50,0%	**>50 years:** 15,0%		**50-59 years:** 31,4%			
	>60 years: 8,5%	**>60 years:** 17,5%			**>60 years:** 18,6%	**>55 years:** 14,0%	**>55 years:** 14,0%	n.a.
Average age:	37.9 years	52.0 years	n.a.	n.a.	51.2 years	n.a.	n.a.	n.a.
Graduations per year:	~60-90	~2,100	~1,500	~500	~230	~280-450	~300-620	n.a.
Retirements per year:	~80-100	n.a.	n.a.	n.a.	~190	n.a.	n.a.	n.a.
Recent development of figures:	**1999:** 9.280	**2000:** 5.269	**2002:** 47.000[2]		**2000:** 6.336	**2004:** 5.183	**2004:** 10.197	**2004:** 565[4]
	2009: 19.575	**2009:** 5.567	**2008:** 44.700		**2009:** 6.756	**2009:** 5.655	**2009:** 11.954	**2009:** 344[4]
	Var. +110 %	**Var.** +5,7 %	**Var.** -4,9 %		**Var.** +6,6 %	**Var.** +9,1 %	**Var.** +17,2 %	**Var.** -30,1 %
Future projections of figures:	n.a.	**Until 2030:** 3.590	n.a.	n.a.	**Until 2020:** 4,856[3]	n.a.	n.a.	n.a.
		Var. -35,9 %			**Var.** -5,5 %			

[1] Number refers to those *Augenoptiker*, who have succesfully completed the *Augenoptikermeister* examinations. Please consider the restrictions of the designation as optometrists mentioned in chapter 3.2.2.2.

[2] Only the total number of practitioners in the German opticians market was available (including dispensing opticians, optometrists, apprentices and other staff); additionally in 2007 a new method of data acquisition was implemented, which would have led to a number of 48,100 in 2008 and 48,700 in 2009. For reasons of comparability the former statistics were used.

[3] A future projection for German ophthalmologists was only available basing on data of the KBV for independent office-based pracitioners. Thus the latest level of reference is a number of 5,149 practitioners in 2009.

[4] Numbers available for England only

Source: Sicart [2009a]; Sicart [2009b]; IAB [2009]; Bour, Chorre [2006]; De Pouvourville et al. [2003]; BÄK [2010]; KBV [2010a]; ZDH [2010a]; GOC [2010a]; Interview AOP [2011]; Interview GOC [2011a]; FODO [2010a]; NHS IC [2010b]; Own calculations

In France the situation is the following. In comparison to 1999 there are nearly 300 more ophthalmologists performing services, which means an increase of approximately 5.7 % [Sicart 2001]. Albeit in contrast to the German system the current number of graduating ophthalmologists is not sufficient to cover the number of retiring physicians. An evaluation of the figures between 1990 and 2003 shows that around 60 to 90 new ophthalmologists access the market each year, whereas 80 to 100 retire[86] [Bour, Chorre 2006]. This situation was subject to several studies conducted in France in the past few years. Projections of the DREES estimate that until 2030 the number of ophthalmologists performing in the French system will decrease about 35 % to a headcount of less than 3,600 professionals [Atal-Doubert 2009]. Taking into consideration the estimated development of the French population, this figure would lead to a ratio of approximately 5.2 ophthalmologists per 100,000 population in comparison to a number of currently 7.42.

As shown above, the situation of German ophthalmologists is less severe, but also for Germany a decrease of numbers is projected. Although the number of graduations exceeds the number of retirements, the National Association of Statutory Health Insurance Physicians estimates a decrease of primary care ophthalmologists of approximately 5.5 % until 2020 (from 5,143 in 2009 to 4,856), due to a projected decrease of new licensed ophthalmologists at stable retirement rates [Kopetsch 2010]. In this context as the current figures do not indicate such developments, the next years remain to be seen.

Future projections for French and German opticians are not available. In Germany the figures are relatively stable over the past years and the 1,500 new dispensing opticians, who enter the market each year, will not lead to decreasing numbers [ZDH 2010b]. This also applies for German optometrists, regarding about 500 dispensing opticians finishing one of the training routes to become optometrist each year.[87] In France a massive growth of the numbers of practicing opticians can be recognized. Since 1999 the number has more than doubled and this trend seems to continue. Each year almost 2,100 students complete studies to become BTS-OL and due to the fact, that French opticians are a considerably young

[86] With 106 new trained ophthalmologists, the year 2010 yielded the highest number of graduates in the past 20 years. Future developments remain to be seen. More current data about retirement rates was not available.
[87] Meaning those optometrists completing the *Augenoptikermeister* examinations [ZDH 2010c]; graduates of the *Fachschulen* and Universities of Applied Sciences (approximately 400) have to be added, but duplications might be possible, because the *Augenoptikermeister* examination might be part of the curricula of those educational institutions as well.

profession with an average age of less than 38 years, augmented retirement rates are not be expected [Interview AOF 2010].

The situation of the British eye care providers is quite sophisticated to compare to the two other systems, because less data was available. Most of the dispensing opticians and optometrists are between 25 and 39 years old and thus both are in average young professions [GOC 2010a]. The figures record a small increase over the past few years, with approximately 10 % more dispensing opticians and 17 % more optometrists since 2004. Per year 300-600 new optometrists and between 280 and 450 dispensing opticians are educated [Interview AOP 2011; Interview GOC 2011a]. The number of OMPs significantly decreased since 2004 by 30 %. More information regarding the yearly retirements or the future development of figures is not available.

(iii) *Limitations:*

The results of this criterion are subject to various limitations. The most restrictive is an incomplete database. Especially there is a lack of data concerning the number of retirements and subsequent projections about the development of German opticians and the entire British eye care providers. Further restrictions are the different time horizons of the information. For instance, the projection about the future decrease of ophthalmologists is oriented towards 2030, whereas the projection in Germany is oriented towards 2020. Also regarding the development of figures in recent years, there is no uniform reference point to determine. These limitations restrict the comparability and validity of this criterion, but do not change the essence.

(iv) *Conclusions:*

The described results illustrate in a clear manner two essential aspects. First the optician's profession in all three target countries is a very young one and recruitment problems are not expectable. On the contrary, except for the German opticians, in the compared countries an increase of the numbers of opticians and optometrists in recent years was recognizable. This trend seems to continue. In France there was even a real "boom" in the opticians market recognizable. The second conclusion that has to be drawn from the

presented results is that in contrast to the optician's profession, the ophthalmologists in France and Germany are significantly older. In France the problem of over-aging is accompanied by a serious shortage of graduating ophthalmologists. Until 2030 a considerable decrease of the number of practicing ophthalmologists is predicted. In Germany the situation is less severe, but also remarkable. With an average age of more than fifty years the problems the French system has to face are predictable for Germany as well. Although it has to be reconsidered that so far the number of graduations still exceeds the number of retirements, thus the future developments of these figures remain to be seen. Until 2020 the estimated decrease of ophthalmologists is not significant.

4.1.4. Criterion 4: Waiting times

(i) *Objectives and methods:*

The purpose of this criterion is an analysis of the situation of services provision regarding waiting times for patients in primary eye care settings and possible subsequent delays in diagnosis and treatment of visual problems. The presentation of the numbers of practicing professionals, as shown in the antecedent chapters is not sufficient to determine problems of services provision or even gaps in the delivery of services in the daily practice. Waiting times mark an adequate additional indicator regarding this topic.

To find appropriate information about waiting times in the field of primary eye care a comprehensive systematic literature research was adjusted by adequate research terms. In the course of this international, national as well as regional studies have been observed. To complete the results a corresponding question was incorporated into the questionnaire for the expert-interviews about the eye care provision systems in the targeted countries.

(ii) *Results:*

Free and direct access to all primary eye care providers is a deliberate policy in France, Germany and the UK. There are no system-related barriers, which would lead to delays in diagnosis and treatment of the patient or an increased occurrence of waiting times. Consequently waiting times are most likely an indication of underprovision in primary eye

care with an insufficient number of practitioner's participation in eye care services or further allocation or service quality failures.

The results of the literature research were of little relevance. Neither international comparisons, which analyze waiting times in the targeted countries, have been found, nor national evaluations focussing on the issue of primary eye care. Consequently the research was limited to regional and local reports to determine waiting times in primary eye care. The situation in the three countries of comparison can be outlined as follows.

With approximately 33 opticians per 100,000 population France is in charge of a number of opticians significantly above average. Hence it is not surprising, that no waiting times or delays in provision of services are reported in the optician's branch [Interview AOF 2010]. In case of ophthalmologic services the situation is different. The below-average provision of the system with primary eye care providers in combination with a not-uniform allocation throughout the country, leads to waiting times between 2 and 7 months to get an appointment for an ophthalmologic consultation. In some cases waiting times up to 12 months have been reported [Ettelt et al. 2006; La Depeche 2009]. This information is mentioned regularly in local news and reports, and also occurs in the legal initiatives of the French parliamentarians Aboud and Panis regarding the recognition of the optometric profession in France [Aboud 2009; Panis 2010]. Recently it was also mentioned in a report conducted by the French National Authority for Health where average waiting times of three months for an ophthalmologic consultation were reported.[88] In addition it was stated that these waiting times increase in those regions recording a density of less than 8 ophthalmologists per 100,000 population [HAS 2011].

In Germany waiting times for services of dispensing opticians or optometrists are not reported at all [Interview ZVA 2011a; Interview ZVA 2011b]. Occasionally there might be waiting times of a few days for appointments at often frequented optometrist, especially for those professionals focussing exclusively on optometric services. However such delays seem to be exceptional. For ophthalmologic services there are reported waiting times between 2 and 4 months [DOZ 2007a; MDR-Umschau 2007]. But, these evaluations cannot be regarded as representative due to considerable limitations (see next paragraph). The

[88] Confirmed by the President of the French Association of Ophthalmologists.

representing body of German ophthalmologists (BVA) does not deny the existence of waiting times in the German primary eye care system, but mentions as well, that these waiting times are a problem of individual professionals and not system-related. According to the BVA, there are adequate capacities to provide services for the entire population and especially in case of medical urgencies and emergencies, there are no waiting times or delays in treatment at all [Interview BVA 2011]. A clear statement is consequently not possible.

In the UK system comparable to the two other countries there are no waiting times for services of the dispensing opticians. Also for optometric services waiting times are rare and usually do not appear [Bosanquet 2010; Interview ABDO College 2011]. However for an optometrist' consultation a previous arrangement of an appointment is usually necessary. This applies also for German and French ophthalmologists as well as for some German optometrists. The use of waiting lists, which are characteristic for the UK health care system, does not apply to the field of primary eye care. Waiting lists are only used for secondary eye care services. In UK secondary care especially the field of eye care evoked long waiting lists in recent years [NHS 2005]. The enlargement of the range of competencies of British optometrists and their participation in enhanced services schemes were implemented inter alia to reduce frequentation on secondary eye care. The sophisticated interrelation of activities in primary eye care and waiting times in secondary eye care is not the focus of this criterion and will therefore not be specified at this point. Furthermore there is the need for further research to assess this interrelation. A clear statement about the influence of enhanced services on waiting times is not possible at this point. First analyses of enhanced services schemes, e.g. in the Grampian area or in Manchester, show a reduced number of referrals from primary to secondary eye care [Azuara-Blanco et al. 2007; Henson et al. 2003], which could lead to reduced waiting times and waiting lists, but a comprehensive evaluation is missing. A report of the Royal College of Ophthalmologists dating to July 2010 [Black 2010] concludes that the influence of enhanced services on the pressure on secondary eye care cannot be estimated by today.

(iii) *Limitations:*

The comparison of waiting times for the access to services of the different eye care providers in the analyzed countries underlies several restrictions. No international studies

dealing with this topic in France, Germany and the UK were found. Consequently the found information do not base on the same method of data acquisition, time horizons or population. Information was exclusively generated by regional and local reports and expert-interviews, thus a large diversity and heterogeneity of the information are unavoidable. The regional evaluation themselves underlie several limitations. This applies for example to an analysis about waiting times for ophthalmologic services in Germany, conducted by TNT Infratest on behalf of the ZVA [DOZ 2007a]. The method of data acquisition was subject of disputes between the ZVA and the BVA and was finally rejected by a German court [Interview BVA 2011]. Thus the regional and local reports do not fulfil the criteria or stand the requirements of scientific methods of operating and do consequently not serve as adequate reference for this study. The information gained in the interviews has to be challenged as well, due to conflicts of interests of the participants.

(iv) Conclusions:

A clear statement concerning waiting times in primary eye care in France, Germany and the UK is not possible. Regarding the limitations mentioned, the analysis is not quite valid and the reports focussing on waiting times cannot be regarded as accurate. It seems to be obvious and generally not challenged, that there are no waiting times for services of the dispensing optician. Neither in France where the ratio of opticians per 100,000 population is significantly above-average, nor in the UK, where far less professionals participate in the market. Also for optometric services there are usually no waiting times to get an appointment. Merely for ophthalmologic services in France and Germany waiting times were reported, but due to critical methods of data acquisition this information cannot be seen as representative. In France it seems to be undisputed that waiting times for ophthalmologic consultations exist, but even here no official and comprehensive studies were found.

4.1.5. Criterion 5: Protection of consumers

(i) Objectives and methods:

A most recent survey from the UK [College of Optometrists 2011j] has revealed that 86 % of the adult population in the UK value sight more than any other of their senses. This

highlights the importance of eyesight but at the same time calls for high standards of care to be delivered by all eye care professionals. Before addressing the quality of care provided by the professionals (see Criterion 6: Quality of care) it seems to be appropriate to analyse more generally how individuals are protected when making use of primary eye care services. This criterion will therefore have a look at the three countries with regard to institutional arrangements to protect consumers. Considering that consumer protection is a broadly defined term, only selected aspects relevant to consumer protection in primary eye care can be analysed hereinafter. A comprehensive analysis of consumer protection in all its facets would go beyond the scope this survey. The focus is on the following four aspects:

- *Registration/licensure of professionals*

Registration or licensure of professionals regulates the access to the profession. It concerns consumer protection as it ensures that only those individuals carry on the respective profession who are adequately (i.e. as registration/licensure requires) educated.

- *Continuing education for professionals*

Against the background of the medical progress, it is important that professionals involved in eye care keep their skills and knowledge up to date. An obligation to undertake continuing education will contribute to the protection of consumers.

- *Indemnity insurance for professionals*

Although an obligation to take out professional indemnity insurance will first of all protect the professional himself against claims for damage, it gives also security to consumers. In the event of damage consumers can be assured of obtaining compensation, regardless of the pecuniary circumstances of the professional.

- *Protection of professional titles*

Protected titles that only registered or licensed professionals may use and that are therefore bound to certain qualifications give security to consumers on the level of service they can expect from professionals.

Mainly by drawing on information provided in the comprehensive systems descriptions (see chapter 3), each professional group involved in primary eye care in the three analysed countries will be checked for the four aspects. Against the background of an increasing involvement of opticians and optometrists in the provision of eye care services, in particular the question arises, how the optical professions compare with the medical profession with regard to the above listed aspects on consumer protection.

(ii) *Results:*

Registration/licensure of professionals

The French system requires both opticians and ophthalmologists to register in order to carry on their professions. Those opticians establishing a new business are required to register with the prefect of the department of the optician's residence [Article L.4362-1 CSP; Article R.4362-2 CSP]. Moreover, registration with the regional administration of Sanitary and Social Actions (*Directions Départementale de l'Action Sanitaire et Sociale*), the commercial court (*Tribunal de Commerce*) and the Regional Health Insurance Fund (*Caisse Régionale d'Assurance Maladie*) is necessary. The latter case applies only if the optician wishes to participate in the national reimbursement scheme for optical appliances [De Pouvourville et al. 2003]. French ophthalmologists are required by law [Article L.4161-5 CSP] to register with the regional Council of the Medical Profession (*Conseil Départment de l'Ordre des Médecins*), which adds the practitioner's name on the list of medical practitioners (Tableau de l'Ordre Médecins), provided requirements are met [Profession médecin 2010a].

Due to the fact that German opticians are part of the handcraft profession, the German crafts code (*Handwerksordnung - HwO*) applies and requires optometrists (Augenoptikermeister or equivalent) to enrol in the register of qualified craftsmen (*Handwerksrolle*) in order to run an opticians store [§1 HwO]. Noteworthy, the 54 chambers of handicrafts differ regarding the practice of recording opticians stores; some chambers do not record chain stores [Höckmann 2010]. In this case, it is possible that only one optometrist is recorded for running the whole chain including several stores. Dispensing opticians (*Augenoptikergesellen*) are not allowed to run a store, but can only work as employees. On recruitment, they have to provide evidence of their qualification in form of a corresponding certificate which is granted after passing the apprenticeship certification exam. The chambers of handicraft keep registers of apprentices (*Lehrlingsrolle*) where the result of the apprenticeship certification exam is recorded [Müller 2011]. To practice as a medical doctor in Germany, a license to practice medicine (*Approbation*) is mandatory. Medical students are awarded this license after completion of education and newly qualified doctors will then also become mandatory members of the Medical Association (*Ärztekammer*) [Bundesagentur für Arbeit 2007]. The recognition of the completion of the

postgraduate training as ophthalmologist is within the remit of the Regional Medical Associations (*Landesärztekammern*) [MWBO].

In the UK, dispensing opticians and optometrists are required to hold a registration with the General Optical Council (GOC) in order to carry on their professions [GOC 2011g]. Similar to France and Germany, it is a statutory requirement for medical doctors in the UK to be registered with the General Medical Council (GMC) and hold a license to practice [GMC 2011b]. To work as ophthalmic medical practitioner (OMP), which is strictly speaking an exclusive function within the NHS rather than a profession, doctors must be approved by the Ophthalmic Qualification Committee. Approval leads to inclusion in the list of OMPs [UKBA 2007; RCO 2010]. To be allowed to work in the NHS, i.e., to conduct NHS sight tests, OMPs and registered optometrists must be recorded on an ophthalmic performers list of a PCT (England) additionally [NHS IC 2010a].

Continuing Education for professionals

French opticians with an optometric background are offered by the French Association of Optometrists (AOF) the possibility to gain an international certification (ISO 9001-2008), which is awarded to professionals meeting certain quality-related criteria, including continuing education [AOF 2011]. Except for this certification, no further mandatory continuing education for opticians is known. In contrast, French ophthalmologists are (as any other physician) required by the code of ethics for medical professionals to improve their skills and continue education [Article R.4127-11 Code de Déontologie Médicale]. This originally voluntary agreement became mandatory in 2003 [Décret 2003-1077 du novembre 2003]. Physicians are now required to accumulate a fixed number of points (250) during a five year cycle [Garratini et al. 2010].

The situation in Germany is similar to that in France. German opticians are required by the code of conduct of their professional association (ZVA) [ZVA 2009b] to undertake continuing education and training; however, there is no legal requirement to do so [Müller 2011]. Ophthalmologists are obliged to undertake continuing medical education. Beside the self commitment as medical professional to keep up to date with medical advancements [§ 4 MBO-Ä], every SHI-authorized physician is obliged by § 95d SGB V to undertake continuing

medical education activities and has to prove this every five years to the Association of Statutory Health Insurance Physicians.

Dispensing opticians and optometrists in the UK are required by legislation [The GOC (CET) Rules 2005, rules 12-13A] to undertake continuing education and training. A defined number of CET points[89] must be accumulated in order to maintain registration with the GOC. Making continuing education and training mandatory was enabled by amendments to the Opticians Act in 2005 [Hirji, Clarkson 2006]. Being doctors, OMPs are required by guidance of the GMC [2006] to keep their knowledge and skills up to date. Both optometrists and OMPs performing NHS sight tests are granted payments for loss of earning in connection with undertaking continuing education and training [Department of Health 2010c].

Indemnity insurance for professionals

While members of the optical profession in France are not required to carry on professional indemnity insurance [ECOO 2009], this is mandatory by law for the medical profession and thus for ophthalmologists since 2002 [Ordre National des Médecins 2010c; Profession médecin 2010a].

German opticians are not obliged to hold professional indemnity insurance. However, the ZVA has taken out insurance for all affiliated optical businesses[90] against liability claims arising from refraction services and fittings. Public liability insurance is necessary for German opticians in order to get approval for supplying optical appliance within the SHI scheme [Müller 2011; DOZ 2007b]. In contrast, ophthalmologists are required to hold sufficient professional indemnity insurance as this is an obligation for all physicians practicing in Germany [§ 21 MBO-Ä]

In the UK, dispensing opticians and optometrists are obliged under the Opticians Act 1989 [section 10A] to hold professional indemnity insurance while being registered with the

[89] See chapters 3.3.2.1 and 3.3.2.2 for the exact CET requirements for dispensing opticians and optometrists.
[90] Affiliation with the ZVA is indirectly through the opticians' regional guild associations, which are members of the ZVA.

GOC. Practitioners must prove corresponding coverage on their initial registration and on renewing of the registration. As with continuing education, indemnity insurance became a statutory duty following amendments of the Opticians Act in 2005 [Hirji, Clarkson 2006]. Being medical doctors, OMPs are obliged by guidance of the GMC [2006] to take out indemnity insurance. In addition, an optician (business) contracting with the NHS in order to provide NHS sight tests is required to hold adequate public liability insurance [The General Ophthalmic Services Contracts Regulations 2008, regulation 51].

Protection of professional titles

The optical profession in France is regulated with regard to the use of its professional title [ECOO 2009]. The title optician (*opticien-lunetier)* is officially acknowledged in the French Public Health Code [Article 4362 Parte Legislative et Reglementaire du CSP]. However, despite recent legal initiatives towards the acknowledgement of the title optometrist (*opticien-optométriste*) [Panis 2010; Aboud 2009], the optometric profession is as yet not officially recognised in France. Regarding the medical profession, the title physician is protected by the French Public Health Code [Article L. 4162-1 CSP] and its unlawful use is punishable.

The title *Augenoptikermeister* is protected by law. The German crafts code regulates that only individuals who have passed the *Meister* examination are allowed to hold the corresponding title [§ 51 HwO]. The title *Augenoptikergeselle* is protected, too. This is due to the fact that the regulations on training as *Augenoptikergeselle* [AugOptAusbV] are approved by the Federal Ministry of Economics and Technology (*Bundesministerium für Wirtschaft und Technologie*) [Müller 2011]. In contrast to this, the title optometrist is not protected in Germany and currently an arbitrary use of this title within the German optical market can be observed [Dietze 2010]. The specialist title 'ophthalmologist' is protected; to hold this title completion of postgraduate training in ophthalmology is required [§ 3 MWBO]. According to the German Criminal Code (*Strafgesetzbuch*), the unauthorised use of the title physician is liable to prosecution [§ 132a StGB].

The professional titles of the optical and optometric professions in the UK are protected under the Opticians Act 1989. It constitutes a criminal offence to use the title optometrist

or ophthalmic optician[91] without being a registered optometrist. The same is true for the title dispensing optician without holding a corresponding GOC registration [Opticians Act 1989, section 28]. The Medical Act 1983 provides for a similar provision according to which it is a criminal offence to use the title physician, doctor of medicine or other titles implying GMC registration without holding a corresponding registration [Medical Act 1983, section 49]. To be recognized as OMP, doctors need approval of the Ophthalmic Qualification Committee. Recognition is regulated in the National Health Service (Performers Lists) Regulations 2004, regulations 36-37.

Table 20: Aspects on consumer protection

	France		Germany			UK		
	Optician	Ophthal-mologist	Dispensing Optician	Optome-trist	Ophthal-mologist	Dispensing Optician	Optome-trist	OMP
Registration/licensure	✓	✓	✓	✓	✓	✓	✓	✓
Continuing education	-	✓	-	-	✓	✓	✓	✓
Professional indemnity insurance	-	✓	-	-	✓	✓	✓	✓
Protected title	✓	✓	✓	✓[1]	✓	✓	✓	✓

[1] This does not refer to the title optometrist, which is not a protected title in Germany, but to the title Augenoptikermeister.

Source: Institute for Health Care Management and Research

Table 20 summarizes the results on the four analysed aspects on consumer protection.

(iii) *Limitations:*

The four analysed aspects will probably contribute to consumer protection to different degrees. For example, the registration or licensure of professionals can be regarded as of fundamental importance as it regulates permission to practice. Compared with this, the aspect whether or not professionals are required to undertake continuing education certainly weights lower. Similar, the four aspects weight differently with regard to the respective eye care professional as professionals are legally disposed of different scopes of practices. This limitation does not only affect the comparison between different professions, but also the inter-country comparison of one profession. Therefore, it has to be stressed that the tabular summary (Table 20) has no evaluating character but is simply descriptive.

[91] Optometrists were formerly known as ophthalmic opticians [AOP 2008].

Although four important aspects of consumer protection have been analysed within this criterion, it has to be acknowledged that there are further aspects relevant to consumer protection in primary eye care (e.g. data protection, protection against unfair competition), which have not been addressed here.

(iv) Conclusions:

Consumer protection has been analysed in terms of four selected aspects. The medical professions of all four countries compare similar with regard to these aspects and indicate a high degree of consumer protection. The same is true for the optical professions in the UK, which are in no way inferior to the UK medical profession concerning analysed aspects. Especially the amendments of the Opticians Act in 2005 have contributed to an improvement of consumer protection as these amendments enabled the introduction of both mandatory continuing education and mandatory indemnity insurance coverage. Although these two aspects of consumer protection are not legally obliged for French and German opticians, at least the professional association of opticians in Germany (ZVA) has made efforts with regard to both; continuing education is required by its code of conduct and the ZVA has taken out insurance for all affiliated optical businesses. However, the fact that the title optometrist is not protected must be judged as a serious shortcoming in terms of consumer protection, as this brings confusion to the public.

4.1.6. Criterion 6: Quality of care

(i) Objectives and methods:

Aim of this criterion is to compare the quality of primary eye care in the three countries. To find evidence of this, it is sought to identify studies evaluating the quality of care provided by eye care professionals. Since the quality of care delivered by ophthalmologists is not called into question, the focus is on studies dealing with optometrists and opticians. The quality of some of their services should not be put into question either; these are their traditional services of manufacturing of optical appliances, their fittings and the refraction. The focus is more on the quality of clinical care, including the performing of eye examinations, targeted screening for ocular pathologies and with regard to UK optometrists further enhanced

services such as the pre- and post-operative cataract care or the treatment of minor eye conditions. These services are on the one hand within the scope of practice of optometrists or opticians, while on the other hand they are – especially in Germany and France – traditionally done by ophthalmologists. Considering this overlap, the question arises as to whether these services are performed by the optical professions with the same quality as delivered by ophthalmologists.

A number of studies could be identified within the systematic database research initially conducted in preparation of this survey (see chapter 2) as targeted search terms (*quality* and *outcome*) had been used. Identified studies were solely focussing on UK optometrists. The same was true for studies which could be found within the unsystematic search, except for one German study. Despite this limitation, preventing a three country comparison a priori, the evidence found in these studies for the quality of care delivered by UK optometrists and their German colleagues will be presented. Most of the studies from the UK focus on the quality of optometric care related to certain conditions, such as the diagnostic accuracy of glaucoma referrals. To present the results on a systematic basis, it therefore seems to be appropriate to group the studies by conditions that are mainly addressed.

(ii) *Results:*

The core service provided by UK optometrists is the eye examination or sight test. Conducting routine eye examinations make up the greater part of the working day of most optometrists [Shah et al. 2009c] and nearly 20 million sight tests are carried out annually in the UK, with a rising trend [FODO 2010a]. The quality of this optometric core services in general is addressed in some of the studies found (see Table 21) and should be dealt with briefly, before then proceeding with the studies relating to single conditions.

Table 21: Studies on the quality of optometric eye examinations

Studies on the quality of optometric eye examinations
Shah et al. [2008] The content of optometric eye examinations for a young myope with headaches
Shah et al. [2009a] Glaucoma detection: the content of optometric eye examinations for a presbyobic patient of African racial descent
Shah et al. [2009b] The content of optometric eye examinations for a presbyopic patient presenting with symptome of flashing lights

Source: Institute for Health Care Management and Research

The series of articles by Shah and colleagues report from a research project during which about 100 community optometrists located within 1.5 hour travelling distance of central London were visited by three standardized patients (actors trained to simulate real patients) for a routine eye examination. Each patient was presenting a different patient scenario (see Table 21). Optometrists had given consent to participate in the study, but were kept unaware of when the three visits occurred; patients presented incognito. Following each visit, the standardized patients completed a case-specific checklist of questions and tests that may be carried out during the consultation. The checklists based on expert panels' opinions and information from evidence-based reviews and clinical guidelines [Shah et al. 2009c]. One of the aims of this study was the evaluation of the appropriateness of the eye examinations carried out for the presented patient [Shah et al. 2008; Shah et al. 2009a; Shah et al. 2009b]. In the first scenario of a 20-year-old myope complaining of symptoms suggestive of migraine headaches [Shah et al. 2008], 98 % of the optometrists identified the presence of the headaches, but none practitioner asked all eight questions considered as gold standard for the investigation. At least half of the questions were asked by 22 % of the practitioners. The second scenario [Shah et al. 2009a] provided for a 44-year-old presbyopic patient of African racial origin, a patient group considered at risk of primary open angle glaucoma (POAG), complaining of recent difficulties with her near vision. Tonometry and optic disc assessment were carried out by 95 % of the optometrists who thereby complied with the advice from the College of Optometrists that at least two of the three tests tonometry, optic disc assessment and visual field assessment should be performed on patients aged over 40 years. All three tests were performed by 35 % of practitioner, visual field testing by 36 %. The patient was advised by 6 % of practitioner on the increased POAG risk as patient of African

racial descent. The presenting symptoms of flashing lights of the 59-year-old presbyopic patient in the third scenario [Shah et al. 2009b] were identified by 87 % of the optometrists without prompting. 35 % of the practitioner asked four of the seven gold standard questions relating to these symptoms, but none asked all seven. Regarding all three scenarios, Shah et al. [2008; 2009a; 2009b] came to the conclusion that future continuing education for optometrists could usefully address the conditions analyzed in the scenarios; moreover, their findings led them to the conclusion that there is no 'standard sight test'. The authors do not draw a definite conclusion regarding the performance of optometrists on sight testing.

Most studies found address the quality of optometric care with regard to glaucoma. In the UK, glaucoma cases are mostly detected by community optometrists, who then refer the patients to hospital ophthalmologists for final diagnosis and treatment. As glaucoma diagnosis is difficult, there are local schemes in order to improve the accuracy of glaucoma referrals by optometrists: on the one hand, 'normal' community optometrist repeat diagnostic tests in suspects to determine the ocular pathology, on the other hand, optometrists who are specifically trained with regard to glaucoma perform extended examinations on patients referred from other optometrists to refine their referrals. Moreover, the monitoring of patients with stable glaucoma or ocular hypertension (OHT) is undertaken by some community optometrists; traditionally, these services have been delivered in the hospital outpatient setting [AOP 2008]. In the course of the establishment of such enhanced service schemes, a number of studies were carried out in order to evaluate schemes. Table 22 lists relevant studies, including the German one on glaucoma screening.

Table 22: Studies on the quality of glaucoma related care

Studies on the quality of glaucoma related care
Syam et al. [2010] The Petersborough scheme for community specialist optometrists in glaucoma: a feasibility study
Uihlein, Dietze [2009] Zur Verlässlichkeit des Glaukomscreenings durch den Augenoptiker/Optometristen, Teil 2
Azuara-Blanco et al. [2007] The accuracy of accredited glaucoma optometrists in the diagnosis and treatment recommendation for glaucoma
Bowling et al. [2005] Outcomes of referrals by community optometrists to a hospital glaucoma service
Gray et al. [2000] The Bristol shared care glacuoma study: outcome at follow up at 2 years
Spry et al. [1999] The Bristol Shared Care Glaucoma Study: reliability of community optometric and hospital eye service test measures
Gray et al. [1997] The Bristol shared care glaucoma study - validity of measurements and patient satisfaction

Source: Institute for Health Care Management and Research

Syam et al. [2010] analysed the role of community optometrists specifically trained with regard to glaucoma in the area of Peterborough (UK) who were both refining glaucoma referrals to the Hospital Eye Service (HES) and providing follow up to stable glaucoma patients. In about 2 years, the 10 optometrists involved saw 1,184 patients on whom they carried out a systematic ophthalmic examination. Clinical findings of the optometrists were compared with those of a lead consultant from the HES and were considered to be of low disagreement in most parameters analysed. Disagreement was 11 % on cup:disc ratio, 7 % on interpretation of visual field, 17 % on diagnosis, 10 % on suggested treatment plan and 17 % on suggested follow-up interval and location.

Uihlein and Dietze [2009] present the results of a study that was conducted as part of a bachelor thesis at the Beuth Hochschule Berlin, Germany. The study analysed the potential agreement between a glaucoma screening performed by an ophthalmologist and a screening performed by an optometrist. Within three weeks, 112 patients received a systematic examination once by an ophthalmologist and once by an optometrist (in any order) at an ophthalmology practice. The second examiner was unaware of the findings of the first examiner. A comparison of the findings revealed a good to very good agreement between

both practitioners; with a sensitivity of 97.9 %, this was particularly true when the findings were simply classified by 'conspicuous' or 'inconspicuous'. Noteworthy, the results of the optometric screening are measured against the results of the ophthalmological screening; and not against a confirmed diagnosis of glaucoma.[92]

The study by Azuara-Blanco et al. [2007] was conducted in the context of a scheme in Grampian, Scotland, which involved glaucoma referral refinement by three specifically trained optometrists. Aim of the study was to compare the diagnostic accuracy of these optometrists with that of junior ophthalmologists against the opinion of a consultant ophthalmologist. Therefore, 100 patients received clinical assessments by all three categories of eye care professionals. Given their results of a substantial agreement in diagnosis and treatment decision between the optometrists and the consultant ophthalmologist (89 % in diagnosis, 88 % in treatment) and a moderate agreement between junior ophthalmologists and the consultant ophthalmologist (83 % and 81 %, respectively), Azuara-Blanco and colleagues came to the conclusion that the accuracy of optometrists with additional training in glaucoma is at least comparable to that of junior ophthalmologists. It is however noted that some cases of glaucoma were not detected.

The study by Bowling et al. [2005] was not associated with an enhanced service scheme, but intended to determine the outcomes of optometric referrals to a hospital glaucoma service in general. Over a ten year period, data of the initial ophthalmological assessment at the Oxford Eye Hospital (UK) of all patients referred by community optometrists for suspected glaucoma were collected. Of 2,505 referrals, 510 patients were diagnosed as having glaucoma, 747 patients as having OHT and 125 were classified as glaucoma suspect. In 1,123 patients there was no evidence of glaucoma or OHT found. Bowling et al. [2005] also give an overview of previous studies on the outcomes of optometric referrals for suspected glaucoma. Nearly all of them found confirmed glaucoma rates above the 20 % revealed in the Bowling survey, although differences between the studies e.g. in diagnostic definitions or classifications systems should be kept in mind. In addition, the sample size of some listed

[92] The authors of this survey had access to the bachelor thesis, in the course of which the study was conducted. It is noticeable that both the optometrist and the ophthalmologist participating in the study share the same surname (Uihlein). This aspect may possibly put the independence of the study methods into question.

studies is small; in contrast, the Bowling study presents the largest survey [Bowling et al. 2005]. An analysis of the other studies mentioned is beyond the scope of this criterion.[93]

The Bristol Shared Care Glaucoma Study aimed to evaluate stable glaucoma monitoring by community optometrists compared with monitoring provided by the HES. After being assessed by an independent research team, 405 glaucoma patients and suspects were randomly allocated to two groups: one group received 6 monthly follow-up by one of 12 glaucoma trained community optometrists (204 patients), the other (control) group received routine follow up by the HES [Spencer et al. 1995]. After two years of follow-up, all patients who completed the trial (184 community and 162 HES patients) were again examined by the research team for intraocular pressure, visual fields and cup/disc ratio. Between both patients groups, no significant differences in key visual parameters were found [Gray et al. 2000]. Within the study it was also tested for validity of measurements; for this purpose, all patients participating in the randomized controlled trial had in addition to the initial research team assessment also been measured by the HES and by one of the optometrists. Following the comparison of the measurements, it was concluded that optometrists have the ability to measure key visual parameters in a quality comparable to that of the HES [Gray et al. 1997]. In addition, the ability of trained optometrists to make reliable measurements of key visual parameters in glaucoma patients and suspects was found [Spry et al. 1999].

Cataract referral pathways are a further field of activity of UK optometrists. In England, these pathways have been ascertained to be even more common than pathways for glaucoma referral refinement [Venerus 2010]. The optometric involvement in such services was also subject to academic review (see Table 23).

Table 23: Studies on the quality of cataract related care

Studies on the quality of cataract related care
Menon et al. [2004] Direct referral of posterior capsular opacification by optometrists
Gaskell et al. [2001] Direct optometrist referral of cataract patients into a pilot 'one-stop' cataract surgery facility

Source: Institute for Health Care Management and Research

[93] The reader is referred to the article by Bowling et al. [2005] for an overview of these studies.

Menon et al. [2004] report from a system of direct optometric referrals of posterior capsular opacification introduced at the Taunton & Somerset NHS Trust (UK). Posterior capsular opacification is a common complication after cataract surgery and requires treatment through laser capsulotomy. 222 optometric referrals, most of them direct ones, for laser capsulotomy to the Department of Ophthalmology at the NHS trust were studied. A diagnostic concurrence of 99 % and a rate of performed laser capsulotomy of 98 % were ascertained. Menon and colleagues judged direct optometrist referrals to be effective and accurate and acknowledged participating optometrists a creditable diagnostic acumen.

Gaskell et al. [2001] evaluated direct optometrist referrals to a pilot 'one-stop' cataract surgery facility, i.e. a service where the ophthalmological assessment and the cataract surgery take place on the same day. 40 optometrists participated in the Scottish study. Seminars detailing the pilot service, including referral guidelines, were offered. Of 169 patients referred directly, 160 got and also kept the appointment at the 'one-stop' service. In all but two patients attending the service, cataract surgery was either performed at the same visit (154 patients) or was at least indicated but deferred for various reasons (4 patients). Of the 9 patients that were not appointed to the pilot service but appointed conventionally, 6 patients were deemed appropriate for cataract surgery. Gaskell et al. [2001] concluded that the need for cataract surgery can be accurately predicted by optometrists and direct optometrist referrals into such a pilot 'one-stop' are feasible.

One study was found addressing the quality of optometric care on diabetics (see Table 24).

Table 24: Studies on the quality of diabetes related care

Studies on the quality of diabetes related care
Burnett et al. [1998] The Implementation of Prompted Retinal Screening for Diabetic Eye Disease by Accredited Optometrists in an Inner-city District of North London: a Quality of Care Study

Source: Institute for Health Care Management and Research

Burnett et al. [1998] evaluated the effectiveness of the implementation of a retinal screening scheme for diabetic eye disease in North London. The scheme provided for specifically trained optometrists who screened diabetic patients and referred them according to defined referral criteria to an ophthalmologist. Within a quality audit, the hospital records of all

patients referred for an ophthalmological assessment were reviewed in order to determine false positive referrals. To determine false negative cases, negative screened patients were invited to be rescreened by an ophthalmologist. Covering a 6-month period and 191 patients, the audit found a sensitivity of 100 %, a specificity of 94 %, a positive predictive value of 79 % and a negative predictive value of 100 %; noteworthy, the results apply to 'referable eye disease' as defined through the referral criteria; and not to the presence or absence of diabetic retinopathy. According to Burnett et al. [1998], the described scheme largely fulfils the standards of a high quality retinal screening programme as set out in national consensus guidelines.

Two further studies were found, both not focussing on a specific condition but on optometric referrals for all ophthalmic subspecialties [Dahlmann-Noor et al. 2008] as well as on optometric management of patients with acute ocular conditions and patients at risk of eye diseases [Sheen et al. 2009]. Table 25 lists both studies.

Table 25: Studies on the quality of diverse aspects of optometric care

Studies on the quality of diverse aspects of optometric care
Sheen et al. [2009] Novel optometrist-led all Wales primary eye-care services: evaluation of a prospective case series
Dahlmann-Noor al. [2008] Streamlining the patient journey - The interface between community- and hospital-based eye care

Source: Institute for Health Care Management and Research

Sheen et al. [2009] evaluated the Primary Eyecare Acute Referral Scheme (PEARS) and the Welsh Eye Health Examination (WEHE), two schemes which exist in Wales since 2003 alongside the traditional NHS sight test. PEARS provides for an optometric examination of patients having an acute ocular condition while WEHE provides for defined ocular investigations to detect eye diseases in at-risk patients. For both types of examinations, which are funded by the Welsh government, patients can either self-refer or be referred by their GP to a PEARS/WEHE accredited optometrist. Within the analysed 8-month period, 6,432 patients visited 274 optometrists for a WEHE or PEARS examination. Using telephone interviews and reviews of optometric and HES notes, the appropriateness of patient management was determined. In 1 % of those individuals who were managed solely in

optometric practice, inappropriate management was apparent. For individuals who were referred to the HES following the WEHE or PEARS examination, optometric management was appropriate in three out of four cases. Sheen et al. [2009] considered the clinical judgement of participating optometrists to be satisfactory and judged optometric management in both schemes to acceptable.

The referral quality of accredited optometrists within a direct referral scheme for all ophthalmic subspecialties is evaluated by Dahlmann-Noor et al. [2008]. All direct optometric referrals to the HES of the West Suffolk Hospital during a three month period in 2003 and a 7 week period in 2006 were assessed. Referral quality was measured in terms of diagnostic accuracy, correct perception of referral urgency and request of appropriate subspecialty eye clinic by comparing optometrists' and ophthalmologists' opinions. Findings revealed a high diagnostic competence of 87 % but a less agreement on both referral urgency (75 %) and request of subspecialty clinic (74 %). 99 % of referrals were deemed appropriate.

(iii) *Limitations:*

Aim of this criterion was to compare the three countries in terms of the quality of primary eye care provided by optometrists and opticians, with the focus on clinical care. This comparison is limited mainly for two reasons:

- *Lacking evidence for France and Germany*

It was sought to identify studies that provide evidence on the quality of primary eye care delivered by optometrists and opticians. Except for the study presented by Uihlein and Dietze [2009], no studies were found. This prevents a comprehensive comparison and restricts the presentation almost exclusively to UK optometrists and related care.

- *Limited generalisability of evidence found in the UK*

Considering the differences in education and scope of practice, it is not possible to draw any conclusions from the evidence found about the UK practitioner to their German or French colleagues; the results of the UK studies are, if any, only applicable to the optometric profession across the UK. But even this applicability seems to be restricted. As most of the presented studies evaluate a scheme that uses specifically trained and accredited optometrists, it can be assumed that this may have improved the performance of optometrists. This limitation is also mentioned in some studies itself, e.g. Burnett et al.

[1998] and Gray et al. [2000]. Likewise, some schemes use defined referral criteria, guidelines and/or protocols.[94] The possible influence of such arrangements on the outcomes of the study is mentioned e.g. by Gaskell et al. [2001] and Burnett et al. [1998]. It is therefore questionable whether the level of quality of care that could be determined in these studies can be assumed to be provided even by 'untrained' optometrists, i.e. without additional training to their regular 4 year education (5 years in Scotland). Interestingly, the influence of both, extra training and guidelines have been studied for the case of glaucoma detection. The study by Vernon and Ghosh [2001] revealed that despite the dissemination of local guidelines for glaucoma detection including referral protocols, there was no improvement in the diagnostic accuracy of optometrists. The impact of training on glaucoma detection was addressed by the two associated studies from Patel et al. [2006] and Theodossiades et al. [2004]. They found a rising number of referrals, but the positive predictive value of referrals remained unchanged.

(iv) *Conclusions:*

Regarding the quality of primary eye care delivered by UK optometrists, a number of studies have provided evidence of an overall creditable level of care. Limitations have also shown that this level of care is often associated with additional trainings and strict protocols which are part of enhanced service schemes. Nonetheless, taking into account that the basis training of optometrists lasts 4 or 5 years and that special trainings within the course of the accreditation for enhances services take only some days, the level of quality determined has of course for the most part to be attributed to the basic training that is completed by all optometrists.

Due to a lack of evidence about the French and German system, no statements about the quality of care provided by optometrists and opticians can be made. There is still a great need for research. To cover this need, comprehensive studies similar to the British ones should be pursued.

[94] This applies to the schemes evaluated by Syam et al. [2010], Azuara-Blanco et al. [2007], Gaskell et al. [2001], Burnett et al. [1998] and the Bristol Shared Care Glaucoma Study.

4.2. Financial and economic criteria

In this section we will focus on financial and economic aspects of the three primary eye care systems. We will analyse the following criteria: costs of eye examinations (chapter 4.2.1), and costs of optical appliances (chapter 4.2.2) as well as the income (chapter 4.2.3) and the costs of education (chapter 4.2.4) of the different eye care providers.

4.2.1. Criterion 7: Costs of eye examinations

(i) Objectives and methods:

In this section we want to compare the cost for an eye examination in the regarded countries. Chapter 3 has demonstrated enormous differences between the three countries with regard to which professionals are carrying out eye examinations and how these services are funded. While in France the overwhelming portion of eye examinations is carried out by ophthalmologists, in Germany a substantial part of examinations, at least those to determine refractive errors and prescribe glasses, is performed by optometrists. Nevertheless, the Statutory Health Insurance (SHI) schemes in both countries cover only ophthalmological services. This is in strong contrast to the UK, where eye examinations are almost exclusively the assignment of optometrists and funding is provided by the NHS for certain eligible groups.

In order to determine the cost for eye examinations, various aspects of service provision and funding outlined in chapter 3.3 will be taken into account and elaborated on in the following

(ii) Results:

The NHS in England, Wales and Northern Ireland remunerates the NHS sight test provided by an optometrist or Ophthalmic Medical Practitioner (OMP) to an eligible person[95] with £20.70 (24.05 €) [FODO 2010a]. When carrying out a sight test (NHS or private), both

[95] See Table 8: NHS sight test entitlements in England, Wales and Northern Ireland for NHS sight test entitlements in England, Wales and Northern Ireland.

professionals are bound to section 26 of the Opticians Act 1989 and associated regulations, requiring them "to perform, for the purpose of detecting signs of injury, disease or abnormality in the eye or elsewhere

(i) an examination of the external surface of the eye and its immediate vicinity

(ii) an intra-ocular examination, either by means of an ophthalmoscope or by such other means as the doctor or optometrist considers appropriate,

(iii) such additional examinations as appear to the doctor or optometrist to be clinically necessary"

[The Sight Testing (Examination and Prescription (No 2) Regulations 1989, Regulation 3(1)]. According to the Association of Optometrists [Interview AOP 2011; AOP 2000] an NHS sight test will always include symptoms and history taking, refraction, binocular vision assessment, and an external and internal examination of the eye. In addition, visual field examination and tonometry form part of an NHS sight test, if clinically indicated. At least these core procedures will also be done within a private sight test, but further may be included. The average cost of a private test is indicated with £23.05 (26.78 €), but within a wide range of £10 (11.62 €) to £50 (58.09 €) [FODO 2010a], probably also reflecting its different content. The cost for a private sight test may be reimbursed by private health insurance [Interview AOP 2011], although only about 11 % of the UK population has private health insurance coverage [Smith, Goddard 2009]

In Scotland, the NHS replaced in 2006 the traditional NHS sight test through a new NHS eye examination that is free for the whole population [ISD Scotland 2010]. The new NHS primary eye examination is remunerated with a fee of £37 (42.98 €) for people under 60 years of age and £45 (52.28 €) for people aged 60 years or above. The fee for an NHS supplementary eye examination is £21.50 (24.98 €) [FODO 2010a]. For both examinations, Scottish NHS regulations[96] specify the tests and procedures that have to be performed; specification is also on the basis of age and medical condition.

For both the NHS sight test and the NHS primary eye examination there are set maximum frequencies (minimum intervals) dependent on patient's age and clinical condition. Intervals are mostly one or two years. However, in justified cases earlier examinations are possible [FODO et al. 2009].

[96] The National Health Service (General Ophthalmic Services) (Scotland) Regulations 2006, schedules 3 and 4.

In the French SHI scheme, eye examinations performed by ophthalmologists are remunerated within a consultation fee. Given the ophthalmologist is working in sector I, this fee is usually between 25 € and 33 €, depending on the way the patient is seeking access to the ophthalmologist. 28 € are charged if the patient is referred by his primary physician (gatekeeper). Up to 33 € are possible in the case where the patient has no gatekeeper indicated at all or consults the ophthalmologist without a referral from his indicated primary physician for services other than renewal of a spectacle or glaucoma diagnostic or (after-) care. 25 € apply if the ophthalmologist is the gatekeeper of the patient [L'Assurance Maladie 2011a]. There are also exceptions[97] that provide for a consultation fee in sector I above the range of 25-33 €. Ophthalmologists practising in sector II are free to set their own fees at a reasonable level above sector I fees [see excursus in chapter 3.1.2.1]. Taking into account that fees are mostly 150 %-200 % above the sector I fees [Aballea 2007], it can be supposed a range of 37.5-66 € for sector II consultation fees. For both sectors, the SHI reimburses the emerged fee only in part. 70 % of a base rate of 25 € or 28 € (sector I) or 23 € (sector II) are reimbursed. In cases where the patient consults the ophthalmologist without having a gatekeeper indicated or without being referred by his indicated gatekeeper (except spectacle renewal or glaucoma care), the reimbursement rate is only 30 % [L'Assurance Maladie 2011a]. Consequently, a not inconsiderable portion of the cost is principally borne by the patient (out of pocket payments), though it might be covered by complementary health insurances taken out by the overwhelming part of the French population [Schölkopf 2010; Garnero, Rattier 2009].

In contrast to ophthalmological examinations, eye examinations carried out by French opticians are not covered by the SHI scheme at all [De Pouvourville et al. 2005; Interview AOF 2010]. Their cost range from free services up to 60 € and have to be paid out of pocket by the patients, although some complementary health insurances assist with the financing [Interview AOF 2010].

Similar to the French system, the German SHI scheme remunerates the basic ophthalmologic eye examination within a consultation fee (*Augenärztliche Grundpauschale*). Services compensated with this fee may include, among others, the medical report, clinical-neurological basic diagnostic, determination of visual acuity, subjective and objective

[97] Exceptions are the *avis ponctuel*, the *dépassement autorisé plafonné* and the *droit permanent à dépassement*.

refraction, tonometry, slit lamp microscopy and assessment of the central fundus [EBM 2011]. The fee scale of the SHI values the consultation with a fixed number of points: the consultation of an insurant aged 6 to 59 years is worth 515 points; that of person 60 years or above is 610 points; and that of a child 5 years or under is 620 points [EBM 2011]. Multiplying these points with the national point value[98] of 0.035048 € [KVH 2011] determines the value of the consultation fee: it ranges from 18.05 € to 21.70 €. Ophthalmologists may charge this fee once a quarter only [EBM 2011].

Ophthalmological services outside the statutory system[99] are priced according to the fee scale GOÄ (*Gebührenordnung für Ärzte*). As this private scheme provides mostly for remuneration as fee-for-service, final cost for an eye examination depends on single services that have been included. There is no standard eye examination, thus no standard cluster of services can be designed to calculate the cumulative costs of such. Table 26 shows an extract of the GOÄ relevant to primary eye care. Based on a single rate, the GOÄ allows for applying a multiplier to the fee. As a multiplier up to 2.3 can be applied without statement of reasons, this multiplier is applied in more than 90 % of all cases. Although some of the listed services are not chargeable in combination, several service combinations are possible, subject to individual circumstances, and would determine the respective cost of the examination.

[98] The point value on national level is for orientation and may differ on regional level.
[99] This applies to privately insured patients and IGeL-services.

Table 26: Gebührenordnung für Ärzte – extract

Number	Service	1-fold rate	2.3-fold rate
1	Consultation	4.66 €	10.72 €
3	Extensive consultation	8.74 €	20.10 €
6	Examination of all eye segments	5.83 €	13.41 €
1240	Slit lamp microscopy	4.31 €	9.91 €
1256	Tonometry using the applanation tonometer	5.83 €	10.49 €[1]
1210	Initial fitting and choosing of the contact lens for one eye	13.29 €	30.57 €
1211	Initial fitting and choosing of the contact lenses for both eyes	17.49 €	40.23 €
1212	Check for fit and function of the prescribed contact lens for one eye and if necessary fitting of another contact lens	7.69 €	17.69 €
1213	Check for fit and function of the prescribed contact lenses for both eyes and if necessary fitting of other contact lenses	11.54 €	26.54 €
1200	Subjective refraction with spherical glasses	3.44 €	7.91 €
1201	Subjective refraction with spherical-cylindrical glasses	5.19 €	11.94 €
1202	Objective refraction	4.31 €	9.91 €
410	Pachymetry 1st eye	11.66 €	26.82 €
420	Pachymetry 2nd eye	4.66 €	10.72 €
1225-27	Perimetry	7.05-14.46 €	16.22-33.26 €
[1] 1.8-fold rate.			

Source: GOA [2011].

Eye examinations performed by German optometrists are not covered through the SHI scheme at all. Costs are borne by the patient, or possibly his private health insurance, although refraction services are frequently offered for free or are offset against purchased spectacles [Interview ZVA 2011b]. According to interviewed experts, the fair price for a comprehensive eye examination would be up to 100 € [Interview ZVA 2011a; Interview VDCO 2011].

Table 27: Cost of eye examinations

France	Germany	UK
Ophthalmologists statutory system: 25-33 € Opticians[1] private: 0-60 €[3]	Ophthalmologists statutory system: 18.05-21.70 € Optometrists private: 0-100 €[3]	Optometrists and OMPs NHS[2]: 24.05 € private: 26.78 € (Ø)
[1] Only those optcians having completed postgraduate training in optometry might perform an eye examination. Regarding the legal issue of opticians performing eye examinations, see chapter 3.1. [2] Refers to England, Northern Ireland and Wales only. [3] No average value was ascertained. Data for Germany refers to a fair price as indicated by interviewed experts [Interview ZVA 2011a; Interview VDCO 2011]. It is unknown if this price is actually charged in practice.		

Source: L' Assurance Maladie [2011a]; Interview AOF [2010]; EBM [2011]; Interview ZVA [2011a]; Interview VDCO [2011]; FODO [2010a].

Table 27 summarizes the cost for eye examinations in the three countries.

(iii) *Limitations:*

A comparison of the cost of eye examinations between the three countries as well as between different eye care professionals in one country is limited for several reasons.

Evidently, there is no standard eye examination as requirements will of course vary with each patient. The definition of an eye examination may also differ by profession and country, as different scopes of practice are conceded to eye care professionals. German optometrists, for example, are not allowed to use diagnostic drugs within an eye examination, while their British counterparts are [Cagnolati 2006]. This limitation may also affect the comparability of eye examinations performed by two different professions in one country.

Regarding the three statutory systems it is difficult to draw a comparison as systems do not provide for fee-for services, but for a fixed rate for an eye examination, while at the same time do not specifying its content. Strictly speaking, the French and German SHI schemes do not even provide for an origin 'eye examination fee', but for a consultation fee. In order to charge this fee, the German system requires ophthalmologists only to have personal contact with the patient, as this is the only mandatory content of a consultation. Refraction, tonometry or slit lamp microscopy, for example, constitutes optional content [EBM 2011].

On the other hand, German ophthalmologists may charge this fee only once a quarter even when examine the eyes of a patient several times during this period. Although the NHS sight test is clearly defined in terms of finance by the corresponding fee that can be charged each time the test is carried out, its content is less defined. Except for the legal duties on sight testing [Opticians Act 1989, s. 26], it is for the optometrist or OMP to decide what to include. Nevertheless, NHS sight tests tend to be very similar regardless of the patient type [Interview AOP 2011].

Concerning the costs for eye examinations carried out by French opticians and German optometrists, interviewed experts indicated wide ranges, which may of course reflect different content of these examinations. However, even if average values could be determined, the lack of a definition in terms of content would limit this comparison as well.

(iv) *Conclusions:*

Statutory systems in all three countries remunerate an eye examination with a fixed rate, ranging from about 20 € in Germany and 24 € in England, Wales and Northern Ireland to 25-33 € in France. Against the background of the outlined limitations, a direct comparison of this cost is not possible. Even if one assumes comparability in terms of content of the eye examinations carried out in the statutory systems (and therefore, for example, would judge the English eye examination provided by optometrists to be more favourable than the examination provided by the French ophthalmologist), it remains questionable whether there are not system-related distortions in the fees. According to FODO [2010a], the cost of NHS sight tests (and also private ones[100]) are significantly subsidized by spectacle sales and actual cost for a sight test is indicated to be more than £46 (53.44 €). But not only British optometrists complain about the underfunding of the NHS sight test [AOP 2011c], also German [Der Augenspiegel 2009] and French ophthalmologists [Bour, Corre 2006] are dissatisfied with the level of funding provided by the SHI systems.

[100] Private eye examinations are kept low due to competition and are therefore also cross-subsidized by retail [Blakeney 2009].

4.2.2. Criterion 8: Costs of glasses and contact lenses

(i) *Objectives and methods:*

A considerable emphasis of this study is set on the activities of opticians[101]. It appears that the sale of optical appliance is the primer source of income of opticians in all analysed countries. Therefore a comparison of the average prices of corrective glasses and contact lenses in the targeted countries seems to be useful. Basing on different health care and primary eye care systems, there will be an additional analysis of possible factors influencing the price in the targeted countries.

Required information was obtained by using different sources. For the comparison of average prices statistical databases were searched supplemented by information of the market research company GfK (*Gesellschaft für Konsumforschung*), the industrial association Spectaris and the FODO statistics for UK. For the evaluation of factors influencing the price an appropriate database research was conducted.

(ii) *Results;*

Various results were found regarding the average price of spectacles, with a lack of comparable data sets. Most data was only available for one of the targeted countries. The following figure gives a brief impression of the situation.

[101] In the sense of dispensing opticians and optometrists

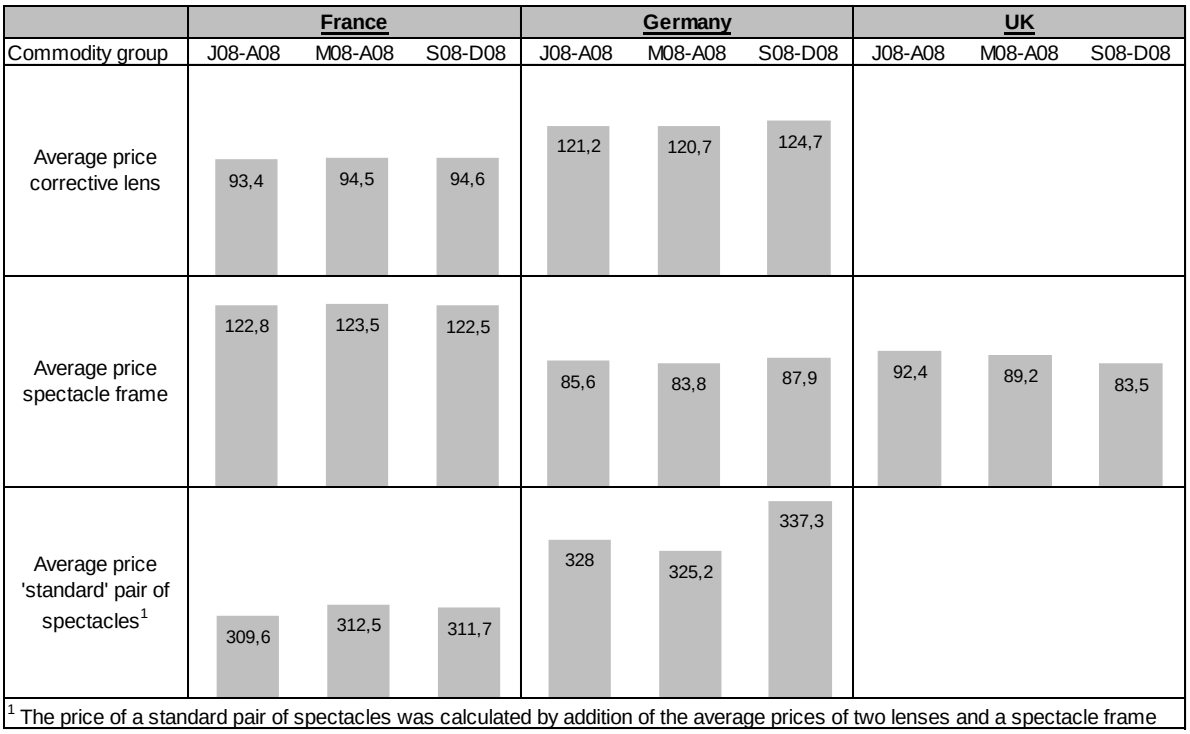
Table 28: Average price of corrective glasses and contact lenses

	France	Germany	UK
Average price of a corrective lens	n.a.	123 €	n.a.
Average price single vision lens (synthetic)	n.a.	66 €	n.a.
Average price bifocal lens (synthetic)	n.a.	242 €	n.a.
Average price spectacle frame	n.a.	87 €	n.a.
Average price corrective glasses	n.a.	360 €	164 €
Average price corrective glasses (single vision lenses)	278 €	n.a.	n.a.
Average price corrective glasses (progressive lenses)	568 €	n.a.	n.a.
Average price contact lenses (per year)	252-489 €	n.a.	n.a.
Average spend on spectacles with NHS-voucher	n.a.	n.a.	£89 (103,40 €)
Average spend on spectacles (private)	n.a.	n.a.	£145 (168,45 €)
Average spend on spectacles overall	n.a.	n.a.	£118 (137,09 €)

Source: Spectaris [2010]; Dobisch [2010]; FODO [2008]

Adequate information was found in the statistics of the market research company GfK, who analysed average prices for spectacles on the basis of defined commodity groups. The results are shown in Figure 13.

Figure 13: Average price of optical appliances (in €)



[1] The price of a standard pair of spectacles was calculated by addition of the average prices of two lenses and a spectacle frame

Source: GfK Retail and Technology [2011]

Evidently the average price of a corrective lens in Germany exceeds the price in France in all merchandise groups by approximately 30 €. The contrary situation occurs with regard to the average price of spectacle frames. Within this three country comparison France records the highest average price of spectacle frames with 122.50-123.50 €. It is significantly higher than the prices in Germany and the UK where prices below 92.40 € are recorded. Nevertheless, due to higher prices for corrective lenses a German 'standard' pair of spectacles is between 12.70 and 25.60 € more expensive than a French version [GfK Retail and Technology 2011].

Unfortunately the prices for corrective lenses and consequently for a 'standard' pair of spectacles were not available for the UK. A width variation of different price-levels was found concerning the average prices of spectacles in the UK. Whereas the GfK statistics shown in Figure 13 record an average price of spectacle frames in the UK of 83.5-92.4 €, the Optometry and Eye Health Care News from Optician Online publishes an average price of only £67.50, i.e. 78.42 €, for an entire pair of spectacles and refers to statistics of the GfK as well [Optician Online 2011]. Other available data, like the annually published FODO statistics do not lead to a better comparability. FODO records the mean amount of money spent on spectacles, but not the average price of a 'standard' pair of spectacles. According to the FODO the average spent on spectacles in the UK was £118 (137 €) in 2008 [FODO 2008], which is significantly below the prices for spectacles in France and Germany. This tendency of low prices for spectacles in the UK in comparison to the other countries is also confirmed by Gunkel [2008]. However, the comparability of the UK figures is considerably restricted.

There are various factors influencing the price of spectacles. A detailed evaluation on the significance and extent of influence of each factor would exceed the capabilities of this project by far. To get an impression this study will present some of the relevant factors and show correlations to the price of spectacles outlined in other surveys.

Basically it has to be reconsidered that all three countries follow the principle of free price setting for optical appliances. Consequently aspects like the cost structure and size of an optician's premise as well as individual financial utility calculations are likely to have great impact on the price of optical appliances. In the context of cost structures especially staff

costs might affect the price regarding different education levels, numbers or salaries of employed personnel.[102] Differences in quality of the goods, the range of products on offer or the share of premises under the umbrella of larger companies have to be taken into account as well. For instance German lenses are said to be of high-level quality leading to higher prices for spectacles [Interview ZVA 2011b].

A few analyses on the impact of reimbursement rates on the average price of spectacles as well as the correlation of regulative measures and spectacle prices (in the UK) have already been published. Cuq et al. [2008] for example recognised that private reimbursement rates are a key driver of spectacle costs, i.e. patients are less sensitive to prices when a substantial part of the costs is reimbursed by private health insurances [Cuq et al. 2008]. According to their survey reimbursement rates of private health insurances – for patients purchasing spectacles after cataract surgery – were about 19 % in Germany and about 44 % in France. This led to significantly higher average prices for spectacles in France. The inconsistence with the results presented by the GfK statistics might be dedicated to the particularities of the survey of Cuq et al. and its fundamental restriction due to a small study population. However, the tendency of a correlation between reimbursement rates and spectacle prices seems probable. This might also apply to the statutory insurance system and the NHS respectively. Looking at the reimbursement rates of statutory health insurances and the NHS granted for the respective eligible groups (see chapters 3.3.4) there are considerable differences. Table 29 shows a brief extract from the reimbursement base-rates for single vision lenses/spectacles. Please consider in this context that only 60 % of the French base rates are reimbursed by the statutory health insurance.

[102] See more about the income of eye care professionals in the targeted countries in Criterion 9: Income of primary eye care providers.

Table 29: Extract reimbursement base-rates for single vision lenses/spectacles

	France[2]	Germany[3]	UK[4]
Sphere[1]			
Plano - 6.00	12,04 €	10,00 €	£36,20 (42,06 €)
6.25 - 9.75	26,68 €	14,52 €	£55,10 (64,01 €)
10.00 - 14.00	44,97 €	31,09 €	£80,60 (93,64 €)
Over 14.00			£182,00 (211,44 €)
Spectacle frame	30,49 €	0,00 €	included

[1] Cylindric (0.25 - 2.00)
[2] For children up to 18 years; base rates for adults are considerably lower
[3] For children up to 18 years and eligible persons according to §33 SGB V
[4] For the NHS-voucher eligible groups

Source: FODO et al. [2009]; L'Assurance Maladie [2011b]; AOK [2008]

There are several particularities in the reimbursement schemes of the statutory health insurances and the NHS in three analysed countries which will not be specified in this survey. However, evidently there are significant differences regarding the reimbursement patterns and rates which could have an effect on the prices of optical appliances.

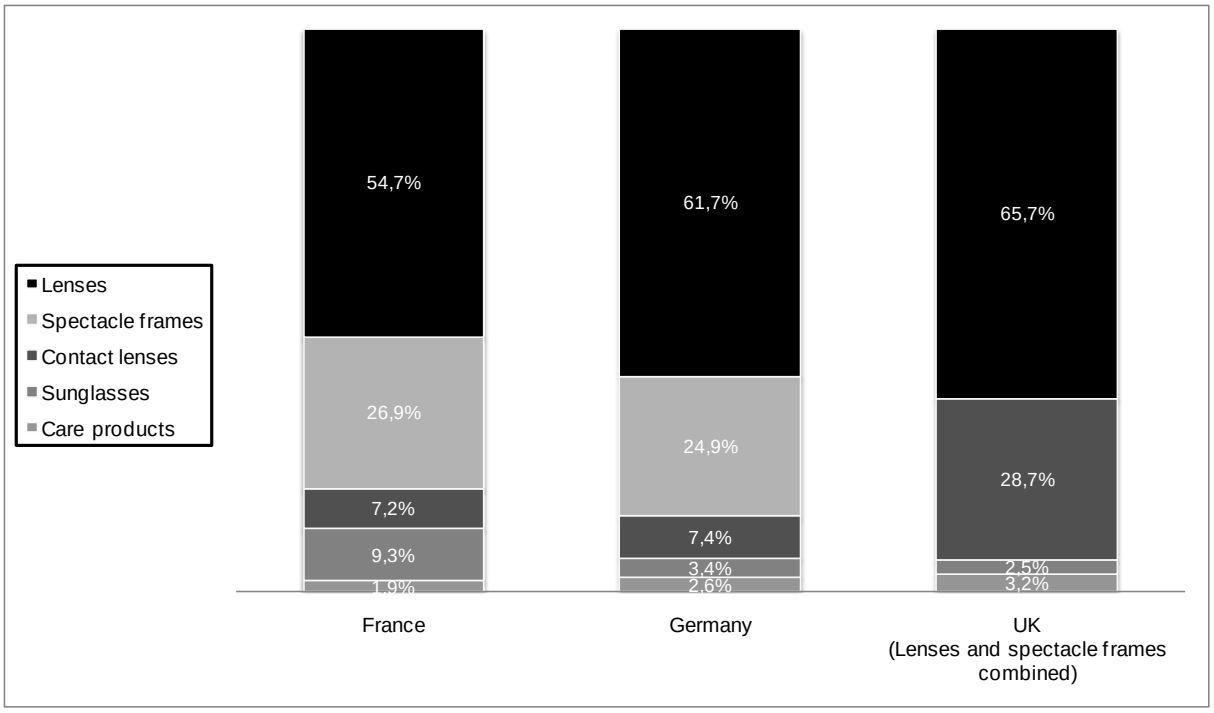
Other correlations were recorded by Richard Calver, who analysed spectacle prices among corporate practices in the UK under changes of regulation. He realised a strong interaction of spectacle prices and supply regulations, NHS payments and the price of eye examinations [Calver 2010].

No surveys have been identified about the impact of different scopes of practice of the opticians' professions in the three countries. Further on, no research has been conducted evaluating the influence of free sight tests on spectacle prices. Moreover the effects of the introduction of opticians' lists by the French complementary health insurers (see last paragraph in chapter 3.1.4) have not been analysed so far. The same applies for the influence of ready-made spectacles[103] or internet sales. Probably there are various other factors that might affect the price of spectacles that have not been analysed so far. An improvement of data availability is necessary and there seems to be a broad field for further research.

[103] Ready-made spectacles are inexpensive spectacles that are sold without prescription various outlet stores.

This also applies to the issue of contact lenses. Comparable data about average prices of contact lenses has not been identified. Nevertheless it is conspicuous in this context, that there is a significant variation regarding the share of contact lenses sales to total market turnovers (see Figure 14). Whereas in Germany and France the proportion is about 7 % in the UK it is almost four times higher (28.7 %). This extended appreciation of contact lenses is also reflected by the willingness-to-pay for contact lenses, which is 2.26 € per capita in the UK in contrast to 1.74 € in France and only 1.05 € in Germany [Spectaris 2010].

Figure 14: Turnovers ophthalmic optics markets (in %)



Source: GfK Retail and Technology [2011]

(iii) *Limitations:*

The presented information is restricted in its validity due to two different reasons:

- The determination of average prices for spectacles might cause a misleading picture. There is a wide range of spectacles on offer at a correspondingly wide range of prices which makes an interpretation of average prices almost impossible. In addition the methods of data acquisition of the presented GfK statistics are not available, which complicates the evaluation further on.

- As indicated, there is a large variety of factors influencing the price. These factors cannot be distinguished in their impact on average prices. Moreover the presented surveys of Cuq et al. [2008] and Calver [2010] are subject to several limitations themselves.

(iv) Conclusions:

A comparison of average prices for spectacles and contact lenses was only possible to a limited extent. The presented results show comparable prices of spectacles in Germany and France, with slightly higher prices in Germany due to more expensive lenses. For the UK – although it cannot be immaculately proved – there seems to be a tendency towards significantly lower prices for spectacles. There are many and various factors probably causing these price differences. A dependence of spectacle prices was determined for reimbursement rates, NHS payments and prices of eye examinations. A more precise statement requires further research work.

4.2.3. Criterion 9: Income of primary eye care providers

(i) Objectives and methods:

The analyses of the two previous criteria indicated differences between the three countries with regard to costs of eye examinations by opticians and costs for optical appliances. In view of the fact that both the sale of optical appliances and the provision of eye examinations are important sources of revenue for optical businesses, it seems to be interesting to consider the income professionals working in optical practices as to whether differences arise as well. Considering that professionals are differently qualified, in addition the question arises as to whether different qualifications are reflected in the level of income. Although the focus of this criterion is consequently mainly on the optical profession, ophthalmologists' earnings are to be analysed, too.

(ii) *Results:*

Optical professions

French opticians may either work as employees or run their own optical practice as self-employed person. Minimum salaries of employed opticians are set out in the collective labour agreement for the optical business in France (*Convention Collective de l'Optique-Lunetterie de détail*), according to which the monthly salary is as of 1 July 2011 between 1,427 € and 2,600 €[104] depending on the opticians' position within the company. While the bottom rate refers to career entrants, experienced opticians are classed with 1,705 €. Higher salaries up to 2,600 € are reserved for executives, i.e. opticians managing one or more shop. Moreover, opticians will be paid an allowance of 133 € for holding the BTS-OL qualification; the CQP qualification is rewarded with 51 € in addition to this. Aside from the fact that the agreement sets out only minimum salary and companies are free to raise wages, factors such as seniority allowance and overtime compensation may boost the salary. Agreed salaries refer to a weekly working time of 35 hours. The annual income of a self-employed optician in France was 72,321 € in 2003 [Bour, Corre 2006], the turnover of an optical shop is indicated with 498,000 € in 2009 [Spectaris 2010].

Similar to France, the labour agreement for the trade of ophthalmic optics (*Lohn- und Gehaltstarif für das Augenoptiker-Handwerk*)[105], concluded between the professional association of opticians in Germany (*ZVA*) and the United Services Union (*ver.di*) in 2002, provides information about the salaries for the profession in Germany. The agreement provides for a salaries ranging from 1,465 € to 2,800 € for opticians. Dispensing opticians (*Augenoptikergesellen*) start with a monthly salary of 1,465 €, but annual increases within the first 8 years of working raise the salary up to 2,000 € at the eighth year. The salary of an optometrist (*Augenoptikermeister*) is 2,130 € without increases for seniority. However, optometrists taking over as operating manager (2,500 €) or manager (2,800 €) are higher remunerated and companies are of course free to exceed all salaries of the agreement. In

[104] Top executives above shop managers may even earn 2,946 €. In contrast, the collective labour agreement provides also for salaries below 1,427 €, but this refers to positions as salesperson or optical technician (with CAP and BEP qualifications), which have therefore not been considered.

[105] The agreement is only for the old West German states (*alte Bundesländer*) without Bavaria, Hamburg and Hesse.

contrast to France, the German agreement is based on a weekly working time of 39 hours. Information about the income of self-employed optometrists in Germany is not available. The annual turnover of an optical shop is 404,000 € [Spectaris 2010].

Two surveys for the UK could be identified, analysing the salary of employed dispensing opticians and employed optometrists. The survey from Hunter Human Capital [2011] based upon a sample of 1,577 optometrists and 422 (non-management) dispensing opticians and ascertained average actual earnings, including all cash remuneration such as basic salary, location allowance and bonuses. Differentiated by geographical regions, the survey found annual earnings between £33,100 (38,454 €) and £39,700 (46,121 €) for newly qualified optometrists (< 1 year experience). Earnings increase steadily with the level of experience and range between £46,900 (54,486 €) and £53,200 (61,805 €) for optometrists having more than ten years experience. Dispensing opticians' earnings are considerable below the optometric level, ranging from £19,800 (23,003 €) to £21,800 (25,326 €) for less (< 1 year) experienced professionals and from £28,800 (33,458 €) to £33,800 (39,267 €) for more (> 5 years) experienced. These results are broadly in line with findings from market research carried out by Myers La Roche [2010] among a sample of 509 optical practices. They found median salaries for optometrists and dispensing opticians of £45,293 (52,619 €) and £24,992 (29,034 €), respectively. This corresponds to a difference of approximately 80 %. For contact lens opticians a median salary of £28,491 (33,099 €) was ascertained. The only available details about the income of self-employed professionals are locum day rates. While optometrists receive about £250 (290 €) per weekday and £300 (349 €) per Saturday or Sunday, locum dispensing opticians can expect on average £160 (186 €) per weekday and £190 (221 €) per weekend day [Myers La Roche 2010].

Medical professions

The gross turnover of a French ophthalmologist working self employed was on average 256,000 € in the year 2008 [Eco-Santé France 2011].

The gross turnover of a self employed ophthalmologist within the German SHI scheme is on average 227,900 € [KBV 2010b]. This is before taxes, social security contributions and operating costs. All three components are yet to be deducted in order to calculate the net

income of an ophthalmologist generated within the SHI scheme. On the other hand it has to be taken into account that ophthalmologists also generate turnover outside the SHI scheme through the treatment of privately insured patients or by performing IGeI services such as glaucoma screening. Both groups of services account for about one third of the turnover generated by ophthalmologists [Statistisches Bundesamt 2009a; Interview BVA 2011].

No data was available about the salary of OMPs in the UK.

(iii) *Limitations:*

Apart from the fact that there is a lack of data concerning OMPs, the limitations mainly concern the comparability of that data which was identified. In order to outline details of the income of employed opticians, various sources had been used. These were, on the one hand, the labour agreements for the French and German opticians, and, on the other hand, the salary surveys covering UK dispensing opticians and optometrists. It would of course be possible to break down the annual salaries stated for the UK practitioners into monthly salaries, in order to compare it with the details given for the German and French opticians. However, a strong limitation would thereby remain as the labour agreements show only minimum salaries, while the surveys for UK practitioners ascertain actual earnings. At least the figures from the salary survey by Hunter Human Capital [2011] include all cash remuneration, i.e., aside from the basic salary also various allowances and bonuses. As for the medical professions only data about the gross turnover could be identified, a comparison between ophthalmologists and opticians is not possible at all.

(iv) *Conclusions:*

The salary level of French and German opticians seems to be broadly comparable. The longer education of German professionals seems therefore not to be reflected in the level of income. Both Germany and the UK provide for remarkable differences in the salaries of dispensing opticians on the one hand and optometrists on the other hand. Nonetheless, taking into account that the salary of German dispensing opticians raises steadily during the first years of employment, the differences in the salary level between dispensing opticians and optometrists in the UK seem to be many times greater. Data showed that salaried UK

optometrists earn approximately 80 % more than salaried UK dispensing opticians; however, training to become optometrist lasts only about one year longer – in some cases it is even four years training for both dispensing opticians and optometrists.

4.2.4. Criterion 10: Costs of education

(i) Objectives and methods:

The final criterion analysis the costs of education of the different primary eye care providers in the countries of comparison. Education takes place in different settings and differs in contents and length. In the course of this criterion there will be an evaluation of the costs of education on two levels. At the initial stage there will be an analysis of costs from the perspective of the educational institution and subsequently will follow an evaluation from the students' perspective by presenting the different tuition fees incurring during education.

Data acquisition was carried out basically via direct contact to the educational institutions. All known institutions were contacted and asked for adequate information[106]. Additional information was gained referring to the expert interviews, national statistic databases and the screening of literature. To identify tuition fees the homepages of all educational institutions were consulted.

(ii) Results:

The number of educational institutions, which responded to our inquiry about education costs, was very low. Especially in France there have been no viable results. Nevertheless, the information led to a remarkable tendency. The situation regarding the costs of education from the perspective of the educational institutions can be outlined as follows.

[106] Anonymity of data was assured to the responding institutions. Consequently no references will be mentioned in this chapter. A list of all contacted institutions can be found in Appendix 7: Consulted educational institutions.

- Germany:

No viable data was available regarding the costs of education of dispensing opticians in Germany. That is basically owed to the dual construction of education, with parts of education taking place in vocational schools and parts in opticians' premises. The average public costs per year and per student at a vocational school have been 2,200 € in 2008 [Baumann, Eichstädt 2011]. The education costs of the opticians' premises have to be added, but were not available.

Costs for optometrists' education are approximately 10,000 € per year and per student. A more detailed evaluation of figures according to the particularities of German education leads to following data (per year):

- *Augenoptikermeister:* ~10,000 €
- *Staatlich geprüfter Augenoptiker:* ~8,000-10,000 €
- *Bachelor of Science Augenoptik/Optometrie:* ~9,000-11,000 €

This information is based on estimations of respective educational institutions as well as on the results of our expert-interviews. Due to only few responses of the educational institutions these figures are not representative and can only be considered as clue.

The costs of educating an ophthalmologist in Germany are also not available in detail. However, the German Federal Statistical Office publishes information about the average costs of education per year and per medicine student, i.e. without ophthalmologic residency. The costs amount to approximately 30,000 €[107] per student and per year at public universities (in 2007) [Statistisches Bundesamt 2009c]. This would signify three times higher costs per year and per student in comparison to the education of an optometrist.

- France:

As previously mentioned there was a lack of viable information of the French educational institutions. Published information of the French Ministry of Education show that on average a BTS (*Brevet du technician Supérieur*)[108] costs about 13,220 € per year and per student [Jeljoul, Dalous 2008]. The average costs of postgraduate training amount to 11,260 € per year and per student [MESR 2010]. Again, more detailed information about the particular

[107] Between 26,980 € and 32,800 € depending on the underlying reference.
[108] With reference to all training routes leading to a BTS, not the special *BTS Opticien Lunetier*.

postgraduate training routes of opticians or about medical education in France were not available. Regarding the average costs of postgraduate training in France in comparison to Germany the figures are quite similar, with a small surplus in Germany (13,823 compared to 12,773 in PPP-$ in 2007) [OECD 2010c]. Basing on this information the assertion can be made that the education costs for opticians and ophthalmologists in France and Germany are comparable, but due to information shortage concerning particular data about opticians and ophthalmologists a more accurate statement is not possible.

- UK:

The costs of education of dispensing opticians and optometrists in the UK are between £8,300 and £8,500 (9,642-9,875 €) per year and per student according to the responding institutions. These costs include teaching only and exclude research related costs, which were not available. In addition it was not possible to evaluate the costs of the pre-registration year. Due to the small number of responding institutions the figures cannot be seen as representative. Nevertheless, the presented figures are in line with the German estimations. Appropriate information about the costs of education of ophthalmic medical practitioners was not available.

Overall it seems to be evident that the costs of educating an optometrist amount to approximately 10,000 € per annum. Education of dispensing opticians seems to be equally expensive when performed at the university. When training is performed in vocational schools, private institutions or as apprenticeship or in mixed settings the costs are difficult to determine and an accurate statement is not possible. The costs of medical education according to the German Federal Statistical Office exceed the costs of optometrists' education by almost three times. For the other two countries no information for costs of ophthalmic medical education was obtainable. Having regard to international studies, Bicknell et al. [2001] mentioned that there is only a handful of medical education cost analyses published; none of them recently [Bicknell et al. 2001]. Most surveys were conducted for the United States, summarised by Jones and Korn [1997], who reviewed studies spanning a period of more than 20 years. They found cost estimations for medical education of between $40,000 and $50,000[109] (adjusted to 1996 US-$) per year and per student. These figures were also confirmed by Franzini et al. [1997], who determined costs of approximately

[109] Pure instruction costs only. For more information see Jones, Korn [1997].

$45,000 per student year for the University of Texas-Houston. Inflation-adjusted to 2011 US-$ these figures would account to between $57,600 and $72,000. This would correspond to between 43,000 € and 54,000 €. Thus, in the international context the German costs of medical education per student year do not appear overestimated.

In the following paragraphs the focus of educational costs will be set on the student's perspective. A comprehensive analysis of tuition fees for opticians, optometrists and ophthalmologists training yields the following results.

In the UK system the educational institutions respectively the universities are state-funded. Tuition fees are similar for all undergraduate training routes and amount to £3,290-3,375 (3,822-3,921 €) per year. Considering government changes of tuition fees starting in the period of 2012-2013, tuition fees will raise to approximately £9,000 (10,455 €) for all undergraduate programs. Fees differ for part-time programs and there are several particularities regarding students' loans or scholarships.

In France the situation is more diverse. Two thirds of the educational institutions offering training routes to become BTS-OL are private and charge up to 6,500 € per year, whereas public institutions usually do not charge any tuition fees. Private institutions might also become contractor to the state and offer education to reduced tuition fees. The same applies for the postgraduate training routes for opticians. A *Licence* or Master at a public university costs merely an annual contribution of between 169 € and 359 € [French property 2011c; Interview AOF 2011] whereas private institutions might charge up to 6,500 € for the same programs (*Licence-Pro Optique Lunetterie*). Tuition fees for the *Unités d'Enseignements* and the *Diplômes d'Universités* amount to between 2,100 € and 2,700 € per course. Students typically complete two courses per year, leading to annual costs up to 5,400 €. There are additional particularities concerning part-time education or the participation of firms, which might affect the price. Medical education in France is typically offered at public universities and fees are considerably low with approximately 200 € per year [Segouin et al. 2007].

In Germany the situation can be outlined as follows. Usually no tuition fees are charged in training routes to become dispensing optician. Concerning optometrists' education, similar

to the French educational system, there has to be distinguished between training routes at public and those held at private institutions. Public institutions might charge tuitions fees up to 500 € per semester, depending on the location of the institution[110]. In view of the fact that medical education is taught almost exclusively at public universities the 500 € contribution per semester also applies for medicine students. Private institutions, which offer optometric education, charge up to 13,000 € tuition fees per year. There is a huge diversity of levied fees depending on the content and length of studies. More information is presented by Lerch [2011].

Summarizing it can be stated, that there is a large diversity of tuition fees for the different training routes. Fees for public institutions are considerably higher in the UK than in France and Germany. In contrast in the last two countries private institutions play a more significant role in the education scheme. These private institutions charge tuition fees which reach or even exceed the level of UK institutions. Looking forward to the UK system amendments starting in 2012 this situation will change again.

(iii) *Limitations:*

In the course of this criterion some of the limitations have already been mentioned. The most significant limitation is the number of responding institutions, which were asked to assess the costs of education from the institution's point of view. Whereas in France no viable results have been obtained at all, in Germany and the UK the sample is not adequate to be regarded as representative. In addition the presented results base on estimations and assessments of the responding institutions and not on detailed statistical evaluations. Different forms of funding (public; private; mixed) and varying contents and forms of training complicate the comparison further on.

(iv) *Conclusions:*

An impeccable statement about the costs of education of eye care providers in France, Germany and the UK would require supplemental research work. Although there are considerable restrictions to the evaluation conducted in this study, there is a clear tendency

[110] The decision of charging tuition fees lies in the responsibility of the Federal States.

recognisable. Optometric education seems to generate comparable costs in Germany and the UK. Annual costs of educating medical students seem to be almost three times higher than training for optometrists. However, reliable data was only available for Germany. French opticians and ophthalmologists have to be excluded from the conclusions due to inappropriate and insufficient data. Regarding tuition fees there is no evident significant difference. Fees at public institutions in the UK are much higher than in the two other countries, but on the other hand private institutions charging similar or even higher fees are more present in the education scheme.

5. Discussion

The present study shows in a comprehensive manner the existing diversity between the three analysed primary eye care systems in France, Germany and the UK. In the following paragraphs there will be a brief summary of the essential differences regarding the systems' construction in the three countries before advantages and disadvantages will be outlined for each system. In a subsequent step there will be a summarising assessment of the criterion-based comparative analysis of chapter 4. Finally in this chapter the most important limitations of this study will be presented leading to the possibility of drawing final valuing conclusions in chapter 6.

5.1. Key facts of the three different primary eye care schemes

The numerous differences between the primary eye care systems in France, Germany and the UK are at best comprehensible having regard to the most important key facts of the systems as described in detail in chapter 3 of this study. Table 30 and Table 31 present a summarising comparison of these key facts showing some of the essential information on regulative framework, education, scope of practice and organisation of primary eye care in the three systems. By collection of these key figures this cross-country comparison can easily extended to other countries. Examplarily we conducted the key figure collection also for the Swiss primary eye care system, presented in Appendix 8: Primary eye care in Switzerland.

Table 30: Key facts of primary eye care in France, Germany and the UK (I/II)

Country	Primary eye care providers	Officially acknowledged title	Profession	Headcount	Density per 100,000 population	Cursus	Length of studies	Educational setting
France	Ophthalmologist	✓	Medical	4.657	7,42	6 years of medical education + 5 years of residency	11 years	University / University hospital
	Optician	✓	Health care	19.575	31,17	2 years of training to become optician (BTS-OL)	2 years	*Lycee* / Private schools
Germany	Ophthalmologist	✓	Medical	5.626	6,88	6 years of medical education + 5 years of residency	11 years	University / University hospital
	Dispensing optician	✓	Handicraft	~17.250	~21,09	3 years apprenticeship (Augenoptikergeselle)	3 years	Vocational school + Optician's premise
	Optometrist	✓[1]	Handicraft	~15.200[2]	~18,61	1-3 years of training basing on the initial 3 years apprenticeship to become Augenoptikermeister (or equivalent)	4-6 years	Private schools / *Fachschulen* / Universities of Applied Sciences
UK	Ophthalmic medical practitioner	✓	Medical	396	0,64	5 years of medical education + 2 years of basic medical training + at least 2 years postgraduate training in ophthalmology	min. 9 years	Medical school / hospital
	Dispensing optician	✓	Health care	5.655	9,15	2 or 3 years of training + 1 year supervised work in practice or 3 years of training combined with working	3-4 years	University / college + optical practice
	Optometrist	✓	Health care	11.954	19,35	3 years of university training + 1 year pre-registration training in practice or 4 years university training incorporating the pre registration year	4 years	University + optical practice / hospital

[1] The title "optometrist" is neither officially acknowledged nor secured in the German system, but the underlying training routes and corresponding titles are (Augenoptikermeister, staatlich geprüfter Augenoptikermeister, Bachelor Augenoptik (FH)); [2] Referring to those optometrists, who have completed the Augenoptikermeister examination. Please consider the restrictions of the designation as optometrist mentioned in chapter 3.2.2.2.

Source: Institute for Health Care Management and Research based on HAS [2011]

Table 31: Key facts of primary eye care in France, Germany and the UK (II/II)

Country	Primary eye care provider	First point of care		Free and direct access possible	Qualified services						
		Refractive errors	Other ophthalmic troubles		Refraction	Prescription of glasses	Fitting of contact lenses	Sales of CL&Glasses	Eye examinations	Use of diagnostic agents	Use of therapeutic agents
France	Ophthalmologist	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
	Optician	(✓)[1]	-	✓	(✓)[1]	(✓)[3]	(-)[4]	✓	(-)[4]	-	-
Germany	Ophthalmologist	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
	Dispensing optician	(✓)[2]	-	✓	-	-	-	✓	-	-	-
	Optometrist	✓	-	✓	✓	✓	✓	✓	(-)[5]	-	-
UK	Ophthalmic medical practitioner	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Dispensing optician	(✓)[2]	-	✓	-	-	-	✓	-	-	-
	Optometrist	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] In case of a renewal of an inital ophthalmologists prescription according to article L.4362-10 CSP; [2] As dispensing opticians and optometrists usually work in the same setting the dispensing optician is a possible first contact as well. Refractive services are typically provided by optometrists. [3] For those aged 16 years or older; [4] See chapter 3.1.3.2; [5] Capability to examine the eye and its annexes, but without making medical diagnoses.

Source: Institute for Health Care Management and Research based on HAS [2011]

The most significant difference between the analysed countries is of course the systems' basic configurations regarding an ophthalmologic model in France, an ophthalmologic/optometric model in Germany and an optometric model in the UK. As it was analysed in detail in the progress of this study and as shown in Table 30 and Table 31, the different systems' configuration leads to a large heterogeneity concerning e.g. status, headcounts, education or scope of practice of the participating professions and the general organisation of primary eye care.

Moreover, the degree of regulation differs considerably between the countries. Whereas the UK-system has set a clear framework for ophthalmic services by implementation of the Opticians Act and the establishment of the GOC, there are no such regulations in France and Germany. A similar degree of regulation in the sense of clearly defined standards of education, scope of practice, access to care or reimbursement of services can be found only for the medical professions, i.e. ophthalmologists, in France and Germany. Opticians in France respectively dispensing opticians and optometrists in Germany are regulated professions as well, but with regard to their responsibilities in the primary eye care scheme there are several obscurities as shown in chapter 3.1 and 3.2. The diversification and continuous development of the professions towards optometry and the targeted establishment as primary eye care providers leads to several overlaps with the ophthalmologists' profession and to incomplete regulations. Such issues will be assessed more precisely in the following of this chapter in regard to the advantages and disadvantages of each primary eye care system.

5.2. Advantages and disadvantages of the three primary eye care systems

France

The most salient advantage of the French primary eye care system is the clearly defined pathway through eye care services. With approximately 90 % of all eye examinations [Bour, Corre 2006; Spectaris 2010] the ophthalmologist is the centre of French eye care services and the first point of contact for the patient, i.e. the ophthalmologists corresponds to a gatekeeper. Ophthalmologists pass high quality education and thus are expected to offer high quality services. From education to licensure, scope of practice and remuneration all aspects

of ophthalmologists' work are regulated. Also consumer protection and maintenance of high quality services is ensured for example by mandatory continuing education and training, the obligation of obtaining indemnity insurance or in the CSP determined measures of punishment in case of malpractice or misconduct.

At the same time as the centralisation on the ophthalmologists' performance is an essential advantage of the French primary eye care system, it is one of the most significant problems and future challenges. Decreasing numbers of active ophthalmologists in the upcoming decade (see chapter 4.1.2) alongside with increasing need for ophthalmic care (see chapter 4.1.1) lead to long waiting times (see chapter 4.1.4) and thus more difficult access to primary eye care services for the patients. For these reasons an increasing participation of non-medical health care professionals in primary eye care is recognisable and is expected to expand in the next years. For the French system this situation applies particularly for the orthoptists' profession, but as presented in this study also for the opticians. Meanwhile approximately 5 % of all eye examinations are performed by opticians [Bour, Corre 2006; Spectaris 2010] and an increasing number of French opticians develop towards optometry. However, with the evolvement of optometry arise also system-related challenges. Whereas the optician is a regulated health care profession according to the CSP, optometry is not a regulated profession in the French health care system so far. Neither for opticians' services nor for optometrists' services there is an adequate legal framework regulating their scope of practice. Whereas the conditions of the optician's work are quite well defined due to a homogeneous education and a traditionally established focus on the sale and supply of optical appliances, the expansion of competencies towards optometric services is regularly subject to legal arguments.

Expecting French opticians to further develop towards optometry and establish as primary eye care provider, another essential challenge of the French opticians' profession becomes obvious. There is a considerably large heterogeneity and diversity of postgraduate training. Whereas the BTS-OL is an officially acknowledged title and the two years training route is more or less consistently regulated, there is a large variety of postgraduate trainings of which some are officially acknowledged and others are not. Additionally there is a lack of regulation concerning aspects of relicensing or continuous education and training, which

would be necessary to expand the range of competencies of French opticians towards optometric services.

At present the system is in a phase of reconstruction and the future role of opticians should be defined by decision-makers soon. Otherwise, there might occur several obscurities; especially for the patients. As an example the current situation of reimbursement can be mentioned. Although the French health care system does not officially permit optometric services of the optician[111], some private health insurances support and encourage these services. For the patients this situation leads to uncertainty regarding the correct choice of the eye care provider, who is responsible for first contact care. Moreover uncertainty arises about questions of reimbursement. Such developments are nothing out of ordinary in a phase of systems' reconstruction, but should be clarified soon to avoid patients' disorientation.

Germany

In Germany the situation can be outlined as follows. The German system provides a very high number of specialists by participation of ophthalmologists and optometrists in primary eye care, which is the chief advantage in the German system. This means fast and easy access to services for the patients. Although there are several services that might be offered by both professions, the patients' pathway through primary eye care services seems to be clearly determined, with first contact to the dispensing optician and optometrist in case of refractive errors and first contact to the ophthalmologist in case of other eye conditions.

Nevertheless, the current situation in Germany also entails risks. Whereas – comparable to the French system – education, scope of practice or licensing of the ophthalmologists is clearly regulated, there are several inaccuracies concerning the German optometrists. The most significant one is that the optometrist is recognised as craftsman and not as health care professional. This is tantamount to an overall responsibility of the Federal Ministry of Economics and Technology, which sets different standards concerning rights and duties of the profession than the Federal Ministry of Health would do. Another problem of the allocation to the handicraft system is the restriction of the optometrists' competencies to

[111] Except for refractions in case of a renewal of an ophthalmological prescription (see chapter 3.1.3.2).

screening measures without the capability of a diagnostic assessment of the eye. For a patient this means that an optometrist is entitled and authorised to examine his eye and prescribe spectacles, but in case of a determined eye disease the optometrist is not authorised to inform the patient what kind of eye condition he might be suffering. This might evoke uncertainty or a misleading feeling of security. In addition there is the fact that the title "Optometrist" is not nationwide established and acknowledged. As described in chapter 3.2.2.2 there is no difference in the range of competencies between the *Augenoptikermeister* and those optometrists holding a bachelor's degree. This reflects also the next challenge of German optometry, which is the significant heterogeneity of training routes, as described in chapter 3.2.2.2. This heterogeneity leads to the situation that professionals with the same title have different skills, but the same range of competencies. There is a smooth transition from refracting opticians to optometrists in the German system, which makes it difficult and confusing for the patients to assess the capabilities of the individual optometrist.

The presented information on German optometry show that the German system still is in a phase of reconstruction as well. The establishment of optometrists as "real" primary eye care provider requires further systems' developments, which implies the detachment of the profession from the handicraft system and the establishment as health care professional including all rights and duties regarding registration, (re-) licensing, continuing education and training as well as issues of liability and remuneration. In accordance, the homogenisation and "academisation" of optometrists' education and the adaption of educational contents towards the standards of the Anglo-Saxon systems and the ECOO-diploma will have to be pursued. In addition the recognition of the title "Optometrist" in the German health care system alongside to a clear distinction to dispensing opticians and to the introduction of an independent legal framework for the profession would be recommendable if the position of German optometrists in the primary eye care scheme is to be strengthened.

UK

As the analysis has revealed, the UK-system is the most advanced system regarding the participation of dispensing opticians and optometrists in primary eye care. This implies certain advantages. A high number of providers generates nationwide fast and easy access to services. The traditionally grown implementation of optometrists into the health care system

leads to a high regulation and a clear assignment of tasks and competencies to the professionals. In addition issues of continuing education and training, (re-)licensing or liability are regulated for all primary eye care providers. A significant advantage of the UK-system is the well defined education, which is essential for the inclusion of non-medical professionals into health care services. It is the only system where dispensing opticians and optometrists are homogeneously educated and receive comprehensive and high-level quality training. To maintain this high-quality education, the educational institutions are reviewed at regular intervals by the GOC, which is another unique characteristic of the UK-system.

The UK is the only country supporting the collaboration of primary eye care optometrists and secondary eye care ophthalmologists by implementation of the enhanced services schemes. This peculiarity appears to be an indicator of a weak point of the UK eye care system, which do not lie in the field of primary eye care, but in the secondary care sector. In the UK primary and secondary eye care services are clearly separated. Thus there is no conjunction of these services at the patients' first point of care, which frequently evokes referrals. As the UK system bases on a strong gate-keeping concept, these referrals traditionally require a triangle constellation, which means a referral from the optometrists to the general practitioner, who refers in turn to a secondary care provider. A high number of referrals is consequently associated with additional costs, administrative effort and inconveniences for the patients. In addition the comparatively low number of secondary eye care providers leads to long waiting times for secondary eye care services (see chapter 4.1.4). The implementation of enhanced services was one of the measures to reduce stress on secondary care. The success of these measures remains to be seen.

5.3. Assessment of the criterion-based three-country comparison

Taken separately, each of the presented countries shows various advantages and disadvantages concerning the construction of their primary eye care systems. To assess the performance of the different systems in comparison to each other, the cross-country evaluation of chapter 4 was initiated. With regard to the structure-, process-, and outcome-based criteria of chapter 4.1 the comparison leads in summary to the following results.

The analysis of the first criterion revealed that all three countries face the same challenge of an increasing future need for ophthalmic care. This is mainly forced by the demographic development of the countries' populations with respect to the age-relation of most eye conditions. Whereas in France and the UK this trend is accompanied with growing population sizes, in Germany the trend is slightly attenuated due to a proposed decreasing population in the next years. Beside the economic consequences of these developments, which are only slightly indicated in this study, the increasing need for ophthalmic care is particularly relevant with regard to the numbers of eye care providers in the different countries.

In this context, as the results of Criterion 2: Ratio of primary eye care providers to population and Criterion 3: Development of figures of primary eye care providers have provided, it is obvious that especially the French primary eye care system faces an uncertain future. The number of primary eye care providers is significantly below the numbers in Germany and the UK already today and is estimated to decrease considerably in the near future. In addition the French system shows a centralisation of primary care providers to the metropolitan areas, especially the Greater Area of Paris, and the South of France whereas the rural areas in northern France show a remarkable scarcity [Audo 2010]. The extension of the range of competencies of the numerous opticians to refractive services in case of a renewal of spectacles might reduce pressure on the primary care ophthalmologists but it can be estimated that this will not be sufficient with regard to decreasing figures at an increasing demand.

The provision of services in Germany and the UK is ensured by a large number of primary eye care professionals at a more or less uniform distribution throughout the countries. The figures are stable or slightly increasing over the past few years and a troubling decrease cannot be estimated so far. Although German ophthalmologists show a similar age-structure as their French counterparts, the figures have been stable and the future development remains to be seen. Except for possible regional scarcities a nationwide insecurity of supply is not indicated at the moment.

The current situation of primary eye care services provision in the three countries is also reflected by the results of the waiting times' evaluation (see Criterion 4: Waiting times). In

the French system waiting times up to 12 month for an ophthalmologists' consultation were reported. Although an accurate figure was not determinable the existence of waiting times for ophthalmologists' consultations is undisputed. In contrast in Germany and the UK no general waiting times have been noted. The assumption of existing waiting times for a consultation of German ophthalmologists insists but was not verifiable in this survey. This situation implies a more comfortable access to care in Germany and the UK than in France.

With regard to the quality-related criteria 5 and 6, the systems' comparison results in the following findings. Consumer protection is an essential aspect in all three countries for all participating professions. The medical eye care providers underlay uniform and strict regulations, which indicate a high degree of consumer protection. Whereas the optical profession in the UK shows a comparable degree of regulation as the medical professions, the optical professions in Germany and France are not regulated to the same extent. However, except for the aforementioned shortcomings in terms of the unprotected title "optometrist", no serious lacks of regulation concerning consumer protection have been recorded.

An accurate comparison of the quality of care in the three countries was not possible in this study due to several restrictions (see chapter 4.1.6). As the quality of services provided by ophthalmologists and OMPs was not called into question as well as the quality of the traditional services of opticians and optometrists like the manufacturing and fitting of optical appliances or refractions, it was only possible within this survey to assess the capability of optometrists performing services according to the categories 3 and 4 of the WCO classification for optometric services (see Figure 1), which means the performing of eye examinations, targeted screening for ocular pathologies and further services such as the pre- and post-operative cataract care or the treatment of minor eye conditions.

For the UK-system the inquiry revealed that adequately trained optometrists are capable of performing such services. In addition no information was found about quality-related troubles or augmented complaints in the UK-system. Thus, the assumption evolves that in the UK-system – as the only system basing mainly on the performance of optometrists – high-quality primary eye care is provided to the patients. Appropriate studies for Germany and France were not available or underlay considerable limitations. However, also for these

two countries no information was reported about quality-related problems neither for ophthalmologic services nor for opticians' or optometrists' performances. The consequences of extended competencies of those professions towards optometric services as performed in the UK cannot be determined. Not even there has been a systematic evaluation neither of the extension of French opticians' competencies towards refractions nor of the German optometrists' capability of performing screening tests. Consequently, an impeccable assessment of the quality of care delivered in the analysed countries is very difficult. It remains the assumption that all three countries perform high quality services and there is no clear superiority or inferiority of one the analogue countries. However, it is an object of study, which should be subject to further research work.

Finally the only remarkable difference between the three countries regarding structure-, process-, and outcome-based parameters is the considerably more difficult access to care or, in other words, the significantly below-average number of primary eye care specialists in the French system. The proposed developments will even worsen the situation within the next years. The German and the UK-system seem to stand on a solid and reliable basis although the necessary developments of German optometry have to be considered in this context.

Significant differences have also not been identified regarding the financial and economic criteria of chapter 4.2. The comparison of the costs of eye examinations performed by the different providers in the three countries shows following essential facts. It seems evident that from the perspective of the statutory systems the willingness to pay for an eye examination is independent from the providing profession not higher than 33 €. A comparison beyond these data could not be delivered due to non-defined services (e.g., a uniform definition of "sight test" or "eye examination" was not possible), the missing of fee schedules for opticians' and optometrists' services or different measures of cross-subsidisation, which distort the demanded prices. Thus again, a clear superiority of one of the countries was not assessable.

The problem of comparability of information also applies for the eighth criterion "Costs of glasses and contact lenses". It is the only criterion of our study where clear country-specific differences were notable regarding average prices of spectacles in the UK significantly below the prices in the two other countries. However, the comparison was subject to considerable

limitations, which makes the determined results highly vulnerable. An assessment of the factors causing the estimated price differences was only possible to a limited extent either. Indeed, certain studies have been found evaluating the consequences of different factors, but a faultless transfer to our three-country comparison was not possible.

Basing on the two previous criteria where differences in the costs of eye examinations and the costs of optical appliances were indicated, it was further on analysed if these differences manifest in different levels of income for the primary eye care providers in the three countries. As the analysis has shown there seems to be a comparable level of salaries for French and German opticians. Remarkable differences have been recorded in terms of the salaries of dispensing opticians and optometrists in Germany and the UK, showing that optometrists earn salaries considerably above the dispensing opticians'. For the medical professions the comparison was more sophisticated as only the incomes of self-employed ophthalmologists in Germany and France were available. In this context remarkable differences have not been recorded. However, the results are restricted due to the fact that the components of income that have been considered in the analyses were not transparently determinable. Consequently, in accordance with the limited results of the two previous criteria, considerable system-related differences concerning the income of eye care providers between the analogue countries were not assessable.

The final criterion "Costs of education" revealed some interesting information. Significant differences between the three countries have not been determined, neither for opticians' and optometrists' training routes nor for ophthalmologists' education. In this context the large heterogeneity of the three systems especially in the field of education and training induced several restrictions to the three-country comparison. In addition this criterion shows the improvable information basis in the primary eye care sector of all three countries as found information was very rare and the response rates to our inquiries nearly nonexistent. Nevertheless, it became obvious that there are considerable differences in education costs between the analysed professions. The long-lasting and comprehensive medical training of ophthalmologists and OMPs seems to be approximately three times more expensive than the education of an optometrist. This estimation is based on the found data for the German system supported by further international references. Associated with this result is the restriction of substantial differences in depth, length and quality of training

between medical and optometrists' education. In addition it has to be considered that except for the UK-system a uniform education of optometrists at defined educational settings is not fulfilled.

Summarising the comparison of the French, German and UK primary eye care system regarding cost-related criteria the following results can be stated. Similar to the structure-, process-, and outcome-based comparison in stage two of our study, a clear superiority or inferiority of one of the three systems was not assessable. This is dedicated to the facts, that on the one hand the systems' differences lead to a difficult comparison of information, which was even complicated by paucity of data-availability and on the other hand, that with regard to the few available and comparable information the differences between the three systems were negligible.

5.4. Summarising evaluation of the presented information

Although "archetypically" different, all three primary eye care systems have worked well in the past and are working today. Eye care services in all three countries meet the demands and requirements of industrialised countries and services are offered at a high-level quality, as it was assessable in this context. Currently, a clear superiority or inferiority of one of the three systems was not determinable in this study neither regarding structure-, process- and outcome-based parameters nor regarding cost-related criteria. Although it has to be stated that the French system faces increasing risks of inadequate access to care for the patients due to a too low number of primary eye care providers, which is reflected by long waiting times for primary eye care consultations. Nevertheless, severe consequences of these circumstances for the patients' security or the quality of care have not been reported so far.

With regard to the future all three countries face an increasing demand for primary eye care services, mainly conditioned by the demographic development of the populations. These developments confront the systems with individually diverse challenges. In France the increasing demand is accompanied by a decreasing number of active ophthalmologists, who cover almost exclusively the sector of primary eye care. As described, the French system senses the consequences of a low number of providers already today and the situations is estimated to exacerbate. Consequently the most important task in the French primary eye

care scheme is to increase the number of providers. Possible solutions might be an augmentation of the number of ophthalmology students, the strengthening of orthoptists' competencies or the enlargement of opticians' capabilities and consequently the establishment of an optometric profession in France.

That a systems' construction basing on the services of dispensing opticians and optometrists might be well-functioning can be seen by the example of the UK primary eye care system. However, it has to be reconsidered that such a systems organisation requires a high degree of regulation, a uniform and academic high-level education and a clearly defined range of tasks. The UK system itself faces the challenge to further reduce the pressure on secondary eye care. The well-functioning primary eye care system should not hide the problems of secondary eye care caused by the relatively small number of ophthalmologists.

The current German primary eye care system provides a sufficient number of eye care professionals. If the German optometrist shall actually provide primary eye care services then he has to become an acknowledged health-care professional basing on academic education and delivering a defined spectrum of services. If the intention of German legislation is not to establish the German optometrist as primary care provider other solutions have to be discussed, because it can not be ruled out that the number of ophthalmologists might not be sufficient to cover the increasing demand for eye care services, in which case the German system would face the same situation France is already facing.

5.5. Limitations

In the progress of this study it was pointed out that the survey is subject to several limitations. Most limitations have been described in detail in the according context, thus this chapter will focus on the presentation of some general restrictions.

As presented in the progress of this study there are different frameworks for both, the basic national health care system and the primary eye care schemes in particular. In addition there is the fact that different professions take part in the organisation and execution of primary eye care services. These professions differ in aspects of legal status, education, scope of

practice, remuneration schemes and many other factors. Moreover, there is the problem of an existing heterogeneity inside the analysed professions. This applies in particular for the opticians (and optometrists) in France and Germany. The opticians' professions in these two countries are in a phase of reconstruction and in doing so in a phase of extension of capabilities towards optometry. These developments and differences led to several inaccuracies, which occurred during the investigation and complicated the comparison.

The existence of the afore mentioned differences led to the necessity of focussing on information and data which was comparable, especially for the criterion-based comparison of the three countries in stage two and three of the survey. However, the availability of such information was very limited. In general, the study was limited by several lacks of data availability as statistical databases were only useful to a certain extent and due to the absence of (peer) reviewed journal articles. Most information was gained by Internet searches and articles published in journals edited by the different professional associations. With such constellations there is always the risk of conflicts of interest.

As data was available only to a limited extent, essential information – in particular concerning the organisation of the different primary eye care systems – was gained by the realisation of expert-interviews. In fact, conflicts of interest or individual utility calculation cannot be ruled out completely when using these methods of data acquisition. To improve the quality of results representatives of all participating primary eye care professions, i.e. opticians and optometrists on the one hand and ophthalmologists on the other hand, have been contacted. In addition, only objective answers have been considered, whereas political or valuing statements have not been included into the study.

6. Conclusions

Summarising all presented facts the following conclusions can be drawn – always considering the underlying limitations. None of the analysed primary eye care systems shows a significant advantageousness. The ophthalmologic primary care model in France as well as the ophthalmologic/optometric model in Germany as well as the optometric model in the UK are principally capable of providing high-level quality services to the patient accompanied by easy access to services and – as far as it was assessable in this study – similar costs. Nevertheless, the current and future challenges for the different primary eye care schemes lead to the necessity of continuous development. As the analysis of the UK-system has shown the participation of adequately educated optometrist as comprehensive primary eye care provider is possible without generating a higher level of risk for the patient.

Thus, in the enlargement of competencies of opticians and optometrists stands one possible solution to face the upcoming challenges in Germany and France. However, it has to be reconsidered that an adequate framework especially for optometrists' services has to be established before transferring further responsibilities. In addition, also other solutions such as the participation of orthoptists in primary eye care or the increase of the number of ophthalmologists might be legitimate subjects for debates.

Appendix

Appendix 1: Systematic database research – search string

In the following the search strategy used to identify relevant references in the systematic database research is presented. Exemplarily the search string utilised in the EMBASE database is shown. The utilised key words were analogously used in the SciVerse Scopus database.

Table 32: Search string EMBASE

#	Searches	Results
1	ophthalmology/ or ophthalmology.mp.	19.534
2	optometry.mp. or optometry/	2.607
3	"eye care professional".mp.	16
4	optician.mp.	65
5	1 or 2 or 3 or 4	21.918
6	health care delivery/ or provision.mp. or health service/	107.338
7	health care financing/ or "health care cost"/ or primary health care/ or ambulatory care/ or "health care facilities and services"/ or health care access/ or health care system/ or health care distribution/ or outpatient care/ or health care delivery/ or patient care/ or health care need/ or hospital care/ or health care policy/ or primary medical care/ or health care management/ or health care organization/ or health care availability/ or rural health care/ or health care quality/ or community care/ or care.mp.	909.743
8	management/ or financial management/ or management.mp. or "organization and management"/ or hospital management/ or health care management/	584.570
9	health care delivery/ or delivery/ or delivery.mp.	237.064
10	distribution.mp. or drug distribution/ or health care distribution/	594.820
11	supply.mp.	66.203
12	demand.mp.	42.657
13	regulation.mp. or regulatory mechanism/	597.306
14	hospital policy/ or policy.mp. or health care policy/ or policy/	117.527
15	education.mp. or postgraduate education/ or continuing education/ or education/ or education program/	297.108
16	evaluation.mp. or evaluation/ or economic evaluation/	596.658
17	"cost effectiveness analysis"/ or effectiveness.mp.	208.998
18	efficiency.mp. or productivity/	146.294
19	responsibility.mp. or responsibility/	26.178
20	drug delivery system/ or health care system/ or political system/ or visual system/ or system.mp.	2.416.008
21	referral.mp. or patient referral/	55.758
22	prescription/ or prescription.mp.	76.264
23	profession.mp. or occupation/	29.659
24	glasses.mp. or spectacles/	5.575

25	"contact lenses".mp. or contact lens/	7.961
26	access.mp. or health care access/	116.734
27	administration.mp.	1.110.981
28	6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27	5.810.617
29	"health care cost"/ or "cost effectiveness analysis"/ or "cost control"/ or "hospital cost"/ or "hospitalization cost"/ or "cost utility analysis"/ or "cost benefit analysis"/ or "cost minimization analysis"/ or "cost"/ or costs.mp. or "cost of illness"/	213.402
30	expenditure.mp. or "health care cost"/	92.500
31	"health insurance".mp. or health insurance/	34.823
32	budgeting.mp. or budget/	8.934
33	health care quality/ or economic aspect/ or medical fee/ or health care policy/ or reimbursement/ or "health care cost"/ or payment.mp. or "organization and management"/	297.481
34	"health care cost"/ or health care access/ or health insurance/ or private health insurance/ or "private insurance".mp. or health care policy/ or economic aspect/	230.317
35	health insurance/ or prescription/ or "health care cost"/ or health care policy/ or co-payment.mp. or "drug cost"/	228.446
36	cost-effectiveness.mp. or "cost effectiveness analysis"/	70.159
37	fee/ or fee.mp. or capitation fee/ or medical fee/	9.576
38	tax/ or tax.mp.	6.876
39	reimbursement.mp. or reimbursement/	16.454
40	charge.mp. or hospital charge/	57.683
41	"drug cost"/ or financial management/ or health care utilization/ or economic aspect/ or "organization and management"/ or health insurance/ or prescription/ or "health care cost"/ or "out-of-pocket".mp. or health care policy/	364.067
42	financing.mp. or financial management/	40.280
43	funding.mp. or funding/	17.845
44	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43	611.473
45	germany.mp. or Germany/	157.439
46	"great britain".mp. or United Kingdom/	100.741
47	france.mp. or France/	86.073
48	europe.mp. or Europe/	63.500
49	5 and 28 and 45	322
50	5 and 44 and 45	32
51	5 and 28 and 46	314
52	5 and 44 and 46	115
53	5 and 28 and 47	105
54	5 and 44 and 47	20
55	5 and 28 and 48	101
56	5 and 44 and 48	29
57	Total	1.038

Source: Institute for Health Care Management and Research

Appendix 2: Exemplary questionnaire – Dispensing opticians (UK)

Institute for Health Care Management and Research

University of Duisburg-Essen

European Council of Optometry and Optics

Comparative analysis of delivery of primary eye care in three European countries

Questionnaire: Primary eye care in the United Kingdom

Background of the interview:

The organisation of primary eye care is highly variable throughout Europe. While in some countries medical examinations of the eye are carried out only by ophthalmologists, in other countries academically educated optometrists take over parts of the routine eye care. Facing the increasing importance of eye-diseases and the emerging (regional) lack of ophthalmologists in several countries, there is a discussion to enlarge the responsibilities of opticians and optometrists in primary eye care.

As a consequence the European Council of Optometry and Optics has commissioned the Institute for Health Care Management and Research of the University Duisburg-Essen to compile a report assessing clinical and economic outcomes of differently organised eye care systems.

The cross country comparison includes France, Germany and the UK. To obtain information about the delivery of eye care in the targeted countries, interviews with local experts will be held. We would like to include an interview with you.

1. Information about the respondant:

1.1. Your name: _____

1.2. Your organisation: _____

1.3. Your position: _____

2. Education and Training

2.1. Which educational routes exist to become a registered dispensing optician in the UK?

- Two years full time training at an approved training institution and in the third year supervised work in practice ☐
- Three years training on day release basis at an approved training institution while working in practice (supervised) ☐
- Three years training on distance-learning basis at an approved training institution while working in practice (supervised) ☐
- Others: _____

_____

2.2. Various qualifications can be gained in dispensing optics: Bachelor of Science (BSc), Foundation Degree, and Diploma.

a) Is the Diploma degree a Diploma of Higher Education (DipHE) or a Higher National Diploma (HND)?

b) Do the three year full-time courses leading to a BSc incorporate the Pre-Qualification Period (PQP, i.e. supervised work in practice) or is the PQP on top of the three year courses?

c) Do all students, irrespective of educational route and qualification, have to pass final ABDO examinations to become a dispensing optician? Is the awarded qualification the ABDO Level 6 Diploma in Ophthalmic Dispensing (FBDO)?

2.3. How many dispensing opticians have a contact lens specialty registered with the General Optical Council (GOC)? (Number of "contact lens opticians")

2.4. How long is the training for a contact lens specialty qualification?

2.5. Bradford University offers a career progression course that allows dispensing opticians to graduate with a BSc (Hons) in Optometry in one calendar year.

a) Is a registered contact lens specialty an entry requirement for this course?

b) Are there further entry requirements, e.g. post registration work experience?

2.6. According to the GOC Annual Report there were 4,418 students registered with the GOC as of December 2008.

a) How many students account for optometry and how many for dispensing optics?

b) How many optometry students and how many dispensing optician students pass final examination per year (number of graduates)?

2.7. Some of the GOC approved courses cannot be found on the Universities' and Colleges' homepages. Have some courses recently been ceased? If so, what is the reason for cessation?

3. Scope of practice

3.1. What is the scope of practice of dispensing opticians in the UK? Please distinguish between acts legally permitted, legally prohibited or not legally defined and thus tolerated. Please also note if the activity is part of the profession's training ("Educated").

Note: The option "educated" is possible in combination with one of the other three options per row.

	Permitted	Prohibited	Tolerated	Educated
a) Adapt and fit spectacles	☐	☐	☐	☐
b) Sell spectacles	☐	☐	☐	☐
c) Prescribe spectacles	☐	☐	☐	☐
d) Adapt and fit contact lenses	☐	☐	☐	☐
e) Sell contact lenses	☐	☐	☐	☐
f) Prescribe contact lenses	☐	☐	☐	☐
g) Examine exterior of the eye	☐	☐	☐	☐
h) Examine interior of the eye	☐	☐	☐	☐
i) Subjective refraction	☐	☐	☐	☐
j) Objective refraction	☐	☐	☐	☐
k) Check binocular vision	☐	☐	☐	☐
l) Ophthalmoscopy	☐	☐	☐	☐
m) Tonometry	☐	☐	☐	☐
n) Perimetry	☐	☐	☐	☐
o) Use of slit lamps	☐	☐	☐	☐
p) Test sight of patients with low vision	☐	☐	☐	☐
q) Prescribe/supply low vision aids for visually impaired	☐	☐	☐	☐
r) Refer patients to medical doctors	☐	☐	☐	☐
s) Refer patients to (eye) hospitals	☐	☐	☐	☐
t) Detect ocular pathology	☐	☐	☐	☐
u) Use diagnostic drugs	☐	☐	☐	☐
v) Use therapeutic drugs	☐	☐	☐	☐
w) Orthoptics	☐	☐	☐	☐

3.2. Do certain of your answers in 3.1. apply to contact lens opticians only?

3.3. Do dispensing opticians and optometrists assemble spectacles by their own or do other employees on the premise undertake such technical services?

3.4. A dispensing optician has the duty to refer patients suffering from an injury or disease of the eye. Is it common that a dispensing optician refers patients? Where does a dispensing optician refer patients to?

3.5. There are about 7,250 opticians' premises in the UK.

a) How are they typically staffed (occupational groups) and equipped?

b) What are usual business hours of an optician's premise? Is the sight test service available all time? Are appointments necessary for a sight test?

c) In which other settings and by which other occupational groups is primary eye care provided? (e.g. general practice, community health clinics)

3.6. How many dispensing opticians are employed and how many are self-employed (sole trader, partnership, franchise)?

3.7. What is the unemployment rate of dispensing opticians?

4. Financial Aspects

4.1. The programme budget of the Department of Health for "Problems of Vision" accounted for £1.66 billion in 2008-2009. General Ophthalmic Services (GOS) expenditure amounted to £430 million in the same time (both data refer to England only). What was the remainder of the "Problems of Vision" budget spent on?

4.2. Responsibility for managing the GOS budget was devolved from the Department of Health to the PCTs in April 2010. Which effects does this have?

4.3. What does the turnover of an optical practice consist of? Please tick the box if the listed item is part of the turnover. If possible, indicate in the last column the item's share of total turnover.

	NHS	Private	% of total turnover
• sight test fees	☐	☐	_____
• sales of spectacles and contact lenses	☐	☐	_____
• remuneration of enhanced services	☐	☐	_____
• _____	☐	☐	_____
• _____	☐	☐	_____
• _____	☐	☐	_____

4.4. How is the price of spectacles and contact lenses determined?

5. Regulative framework

5.1. Do you have any information about the distribution of dispensing opticians, e.g. the number of dispensing opticians by PCT or SHA (Strategic Health Authority)?

5.2. Are there any regulations or incentives to control the distribution of dispensing opticians?

5.3. Do you know if there is a shortage of dispensing opticians in certain regions?

5.4. Could you please describe the main features of the optical voucher system (including the claiming procedure for redeemed vouchers) and the claiming for sight test fees?

5.5. In contrast to powered contact lenses (those for persons aged 16 or over and not registered blind or partially sighted), that have to be sold by or under general direction of a registered optometrist, dispensing optician or medical practitioner, zero powered contact lenses must be sold by or under supervision of such a practitioner.

a) Why is the sale of zero powered contact lenses stricter regulated than the sale of powered contact lenses?

b) In which locations can zero powered contact lenses be sold by law? (e.g. drugstore, pharmacy, internet)

c) In which locations can powered contact lenses be sold by law?

5.6. Spectacles have to be sold by or under supervision of a registered optometrist, dispensing optician or medical practitioner, except

1) spectacles for a person aged 16 or over with two single vision lenses of the same power not exceeding 4 dioptres against presbyopia
2) spectacles exempt under the "The Sale of Optical Appliances Order of Council 1984"

a) Could you please explain the exemption defined under 2)?

b) In which locations can these excepted spectacles be sold by law (drugstore, pharmacy, internet etc.)? Please distinguish between 1) and 2) if appropriate.

6. Miscellaneous

6.1. Are there any distinguishing characteristics regarding the UK model of primary eye care?

In the further progress of our study we would like to analyze different criteria regarding primary eye care. Do you have any ideas, references or contacts where to obtain information about:

- Waiting times and the use of waiting lists
- Protection of consumers
- Quality of care (e.g. existence of pathways or guidelines)
- Outcome based parameters (referral rates, total period of disability etc.)
- Costs for educating the different professions
- Costs of illnesses (e.g. cataract, glaucoma, AMD, diabetic retinopathy)
- Costs of eye examinations
- Costs of corrective glasses and contact lenses
- Income of eye care professionals

Many thanks for your support!!

If you have further questions or annotations, please contact the Institute for Health Care Management and Research:

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Appendix 3: Orthoptists in France

Currently there are about 3,000 orthoptists in France (3,232 according to the last statistics), that's a density of five orthoptists per 100,000 inhabitants. The number has more than doubled in the last 25 years. 2,304 of them work in an independent practice. 605 are employed by an ophthalmologist or another medical specialist and only 323 are working in the hospital sector. Most of the independent orthoptists are working in individual practices; only about 22 % work in group practices. It's a highly feminized profession (approximately 90 %) with an average age of 40 years [Sicart 2010; Bour, Corre 2006].

Education

The training route to become an orthoptist in France is legally regulated since 1966 [Arrêté du 16 décembre 1966]. Currently there are 15 special schools offering courses in orthoptics. These institutes are usually integrated into the medical faculty of a university. Initial education takes three years and finishes with a certification, the *Certificat de Capacité d'Orthoptiste*. Education includes theoretical courses and hospital stages under supervision of accredited ophthalmologists. Conditions of access and content of studies are defined by each institution itself but usually a successful completion of the *Baccalauréat* and a qualifying test is compulsory to get access to education [De Pouvourville et al. 2003; La Page des Orthoptistes de France 2010].

After successful completion of the initial training route orthoptists have several opportunities of postgraduate training. It can be distinguished between training routes offered by private institutions - like the French Association of Orthoptics - and university diplomas (*Diplômes Universitaires – D.U.*), e.g. in Vision sciences (Lille) or in Exploration of Visual Functions (Paris). In total there are ten different university diplomas offered at eight institutions. Under certain circumstances there is also the possibility of obtaining a Bachelor's or Master's degree in different specialties (not orthoptics itself) [De Pouvourville et al. 2003; La Page des Orthoptistes de France 2010].

Valid data about the correct number of students currently registered for orthoptics was not available. According to former statistics there have been 436 students registered in all three

years of education between 2000 and 2001 and about 482 students in the period of 2003-2004. These figures lead to estimations of between 140 and 160 new orthoptists accessing the market each year [Bour, Corre 2006; De Pouvourville et al. 2003].

Licensure as orthoptist

To obtain the permission to practice as an orthoptist after completing studies, there are several formalities to meet. In the first instance orthoptists have to register their diploma with the prefect of the corresponding department (*Préfet du Département*). In addition they have to declare their activity to the local representative of the SHI-scheme, the primary care fund (*Caisse Primaire d'Assurance Maladie*) and become a member of the Family Allowance Fund (*Caisse d'Allocations Familiales*) at the point of practice. There are some other voluntary and mandatory formalities, which shall not be specified at this point [La Page des Orthoptistes de France 2010].

Scope of practice

The scope of practice of orthoptists is widespread through ophthalmic care. While at the beginning their activities were limited to the treatment of binocular vision, meanwhile the focus is set on activities like screening for ocular pathology or rehabilitating and re-educating visual functions [Article R.4342-1 CSP]. The orthoptist is inter alia entitled to use ophthalmic instruments and determine visual acuity or practice tonometry, but exclusively on medical prescription or under supervision of an ophthalmologist (or in some cases other physicians). Approximately 80 % of the orthoptists activities are done on medical prescription. Patients do not have direct access to orthoptic examinations [HAS 2010; La page des Orthoptistes de France 2010].

The full range of activities is listed in the articles R.4342-1 to R.4342-8 CSP. The activities encompass inter alia:

- Measures of rehabilitation and re-education of visual functions
- Recording of ocular imbalances
- Perimetry
- Campimetry

- Exploration of chromatic senses

In 2007 the spectrum of orthoptic activities was enlarged to a wide extent. Since then activities like refractions, the determination of a patients' visual acuity, non-contact pachymetry, non-contact tonometry, optical coherence tomography or the fitting of contact lenses complete the orthoptists' scope of practice.

The orthoptists plays a more important role in the organisation of eye care services in France than in other European countries. In average the French orthoptist has seen 566 patients in 2006 [ONDPS 2009]. In recent years ophthalmologists delegate more and more activities to orthoptists. Whereas in 2000 the French orthoptists have realized about three million acts (about 1,400 per orthoptist), this number rose to 4.5 million in 2008 (approximately 1,500 per head) [Eco-Santé France 2011].[112] The professional associations of French ophthalmologists and by today also the French ministry of health consider an enlarged scope of practice of this profession as a possible solution to ensure the provision of eye care services in France. They are more in favour of delegating services to orthoptists than establishing the optometric profession in the French health care system [Acuité 2011c].

[112] These are only the services performed on medical prescription, not those performed under supervision of an ophthalmologist, because those services are accounted by the ophthalmologist.

Appendix 4: The European Diploma in Optometry

The European Diploma in Optometry has been developed by the European Council of Optometry and Optics (ECOO) to unify the standards of optometric education in the different European countries. Training routes and contents of education to become optician or optometrist vary largely between the member states. The European Diploma takes into account this variety and establishes a graduation that is supposed to facilitate free movement and establishment of optometrists throughout Europe.

The diploma is not a separate training route but a graduation granted under certain conditions. Candidates have to prepare on their own responsibility for the examinations. The diploma consists of three parts, namely:

(A) Optics and Optical Appliances

(B) Clinical Investigation and Management

(C) Biological and Medical Sciences

Each part is divided into three modules. Successful completion of all three parts, by passing theoretical and practical examinations, leads to the title "EurOptom". All examinations have to be completed within a period of six years. To be considered for the ECOO-Diploma candidates must either possess a qualification authorising them to practice independently as optician or optometrist in the European Economic Area or Switzerland; or they have to be in the final year of training [Kluth 2008; ECOO 2011].[113]

[113] For more detailed information please consult the homepage of the ECOO: http://www.ecoo.info.

Appendix 5: Further qualifications for UK optometrists

Specialty qualifications in therapeutics - training

Training in therapeutic specialties comprises a theory course at a GOC approved institution, a clinical placement and a final assessment. To start specialty training, it is required that the optometrist has practiced for at least two years in the UK. Theoretical courses are offered by the following universities: Glasgow Caledonian University and City University London offer courses in Additional Supply and Independent Prescribing, Aston and Manchester Universities run a joint course for Independent Prescribing [College of Optometrists 2011d; GOC 2011l]. The courses, whose lengths depend on universities, are accompanied by an exam [Interview College of Optometrists 2011]. Following the completion of course and exam, trainees must undertake a clinical placement within the Hospital Eye Service or a specialist general practice, supervised by a designated ophthalmologist. Placement spent for Additional Supply is at least 5 days. That for Independent Prescribing is at least 12 days, but may be shortened if one of the other two specialty qualification is already achieved. On completion, the trainee can apply for sitting the Therapeutics Common Final Assessment for Specialist Qualifications offered by the College of Optometrists on behalf of the GOC [College of Optometrists 2011d]. On successful passing of the College's final assessment, College Diplomas in Additional Supply or Independent Prescribing will be awarded, enabling the optometrist to apply for specialist registration with the GOC [College of Optometrists 2011e].

As with standard training for optometrists, specialty training is subject to GOC audit and approval, including visits to the universities and the College of Optometrists [GOC 2008b; GOC n.d.]. Core competencies and outline curricula for therapeutic prescribing are also published by the GOC [GOC 2008b; GOC 2011m]. Registration of the Independent Prescribing specialty with the GOC requires that the applicant declares his intended area of practice, e.g. primary care or glaucoma. The Independent Prescribing registration has to be renewed annually including the provision of a record of the prescribing activity, whereas renewal of the Additional Supply or Supplementary Prescribing registration takes place within usual annual retention process [GOC 2011l; GOC 2011n]. To maintain the specialty registration, additional CET requirements have to be met by the optometrist. In addition to

the 36 general CET points, 18 specialist CET points must be acquired by the end of a three year cycle [GOC 2011o; The GOC (CET) Rules 2005, Rule 13A].

Higher qualifications of the College of Optometrists

Apart from the qualifications (diplomas) in therapeutics that lead to specialty registration with the GOC, the College of Optometrists offers certificates in low vision, glaucoma, content lens practice, orthoptics and diabetes. Entitled for obtaining these qualifications are optometrists who have been on the GOC register for at least one year and hold the membership or fellowship of the College. There is no tuition for the certificates offered by the College, only guidance on how to prepare for examination. Examination for each certificate is made up of three parts: a viva examination focusing on and assessing the content of a clinical portfolio that has to be compiled by the optometrist and submitted to the examiners previously, a written examination and a practical examination. Completing two certificates in a prescribed combination within 5 years leads to the award of a diploma [College of Optometrists 2011f; College of Optometrists 2011g; College of Optometrists 2011h]. The awarded qualifications are the College's own ones and are not registrable [Interview College of Optometrists 2011].

Master degrees and doctorates (universities)

A range of universities in the UK offer postgraduate courses and programmes for qualified optometrists leading to master degrees or doctorates in optometry or related subjects. At the University of Manchester, optometrists can study a taught Master of Science course in Investigative Ophthalmology and Vision Science that lasts one year if studied in full-time mode. Additionally, the university offers two research programmes in optometry: the Doctor of Philosophy programme is designed for three to four years and the Master in Philosophy programme for one year, both if studied full-time [University of Manchester 2011b; University of Manchester 2011c; University of Manchester 2011d]. The City University London has a postgraduate programme in Clinical Optometry on a modular basis. Depending on the number of accumulated credits, optometrists are awarded a Postgraduate Certificate (60 credits), a Postgraduate Diploma (120) or a Master of Science (180) in Clinical Optometry [City University London n.d.]. Since 2008, a part-time programme run by the Institute of Optometry in partnership with the London South Bank University gives optometrists the opportunity to gain a professional doctorate in Optometry. The

programme provides that optometrists are taught the first two years before they spend three years on a research project. Successful participants are awarded the title Doctor of Optometry [Institute of Optometry 2009].

This list of master degrees and doctorates as well as the overview of further education as a whole is not intended to be exhaustive as there might be further opportunities to undertake advanced training in optometry.

Appendix 6: Further qualifications for UK dispensing opticians

Further qualification from the ABDO

Contact lens opticians seeking to deepen their knowledge and skills in contact lens practice can gain a second contact lens qualification from ABDO: the Diploma in Advanced Contact Lens Practice, abbreviated FBDO (Hons) CL. The syllabus for this qualification provides study in the five units toric lenses, presbyopic correction, remedial fittings, current knowledge and case records. Courses towards the qualification are offered by the ABDO College and the City and Islington College. Entry requirement is a minimum of one year experience in contact lens practice after achievement of the Contact Lens Certificate (FBDO CL) [Ewbank 2009; ABDO et al. n.d.]. ABDO offers two more qualification: the Diploma in the Assessment and Management of Low Vision and the Diploma in Spectacle Lens Design [ABDO 2011d].

Appendix 7: Consulted educational institutions

Tables 33-35 contain a list of the educational institutions, which have been consulted in the progress of Criterion 10: Costs of education (either by direct contact or by consultation of the homepage). Owing to a very low response rate of the contacted educational institutions, the search strategy for educational costs of ophthalmologists was changed. In this case no educational institutions have been contacted, but statistical institutions, professional associations and the respective ministries of education. Table 33, Table 34 and Table 35 show the contacted institutions.

Table 33: List of consulted educational institutions in France

France	
Institution	**Homepage**
Institut Supérieur d'Optique Nancy	http://www.iso.fr/nancy.html
Institut Supérieur d'Optique Marseille	http://www.iso.fr/marseille.html
Institut Supérieur d'Optique Paris	http://www.iso.fr/paris.html
Institut Supérieur d'Optique Lyon	http://www.iso.fr/lyon.html
Institut Supérieur d'Optique Toulouse	http://www.iso.fr/toulouse.html
Institut Supérieur d'Optique Nantes	http://www.iso.fr/nantes.html
Institut et Centre d'Optométrie	http://www.ico.asso.fr/
Ecole Supérieure d'Optique de Strasbourg	http://www.esos.fr/
Ecole Supérieure d'Optique de Lorraine	http://www.esol.fr/
Lycée Fresnel	http://lyc-fresnel.scola.ac-paris.fr/
Ecole d'Optique Lunetterie de Lille	http://www.ecole-optique-lille.com/
Université Paul Cézanne	http://www.fst.univ-cezanne.fr/
Université Paris-Sud 11	http://www.u-psud.fr/
Ordre National des Medecins	http://www.conseil-national.medecin.fr/
Profession Médecin (Portail de l'emploi médical)	http://www.professionmedecin.fr/
Association National des Étudiants en Médecine en France	http://www.anemf.org/
Ministère de l'Éducation Nationale, de la Jeunesse et de la vie Associative	http://www.education.gouv.fr/

Source: Institute for Health Care Management and Research

Table 34: List of consulted educational institutions in Germany

Germany	
Institution	**Homepage**
Beuth Hochschule für Technik Berlin	http://www.beuth-hochschule.de/
Fachhochschule Lübeck	http://www.fh-luebeck.de/index.html
Norddeutsches Optik Colleg Schwarmstedt	http://www.ndoc.info/
Fachakademie für Augenoptik Hankensbüttel	http://www.fachakademie-augenoptik.de/
Ostfalia Hochschule für angewandte Wissenschaften	http://www.ostfalia.de/cms/de/
ZVA-Bildungszentrum	http://www.zva-akademie.de/
Fachhochschule Jena	http://www.fh-jena.de/
Fachschule für Augenoptik "Hermann Pistor" Jena	http://www.fsao-jena.de/
Höhere Fachschule für Augenoptik Köln	http://www.hfak.de/home.htm
Staatlich anerkannte Fachschule für Augenoptik im Berufsfortbildungswerk Karlsruhe	http://www.die-meister-macher.de/
Staatlich anerkannte private Fachschule für Augenoptik, Optometrie und Hörgeräteakkustik Karlsruhe	http://www.ifb-karlsruhe.de/
Hochschule für Technik und Wirtschaft Aalen	http://www.htw-aalen.de/
Städtische Fachschule für Augenoptik München	http://www.ffa-muenchen.de/
Hochschule München	http://www.hm.edu/
Statistisches Bundesamt	http://www.destatis.de/

Source: Institute for Health Care Management and Research

Table 35: List of consulted educational institutions in the UK

UK	
Institution	**Homepage**
Aston University Birmingham	http://www1.aston.ac.uk/
Bradford College	http://www.bradfordcollege.ac.uk/
Cardiff University	http://www.cardiff.ac.uk/
City University London	http://www.city.ac.uk/
Glasgow Caledonian University	http://www.gcu.ac.uk/
University of Ulster	http://www.ulster.ac.uk/
Canterbury Christ Church University	http://www.canterbury.ac.uk/
Anglia Ruskin University Cambridge & Chelmsford	http://www.anglia.ac.uk/ruskin/en/home.html
University of Bradford	http://www.brad.ac.uk/external/
University of Manchester	http://www.manchester.ac.uk/
ABDO College	http://www.abdocollege.org.uk/

Source: Institute for Health Care Management and Research

Appendix 8: Primary eye care in Switzerland

The Swiss population is about 7.79 million people [BFS 2011], distributed across the 26 Swiss cantons. The cantons are broadly autonomous and this is also true for health care policy and the organisation of health service provision. The federal state sets legal framework conditions for the health care system, especially regarding health insurance. The Swiss population is subject to compulsory health insurance (*Obligatorische Krankenpflegeversicherung*) as regulated by the Federal Health Insurance Act (*Krankenversicherungsgesetz – KVG*) [Tiemann 2006]. At the beginning of 2011, the benefits catalogue of this basic insurance underwent important changes in terms of primary eye care services when the general allowances for spectacles and contact lenses for children (180 CHF (144.19 €) per year) and adults (180 CHF per 5 years) were excluded from the catalogue. Allowances are now only granted in medically indicated cases [SOV 2011a]. Costs for glasses may be covered by complementary health insurance, which Swiss people are free to purchase in addition to the compulsory basic insurance [Tiemann 2006].

There are 766 ophthalmologists in Switzerland. 600 of them work in the outpatient setting [FMH 2010], which corresponds to a density of 7.7 outpatient ophthalmologists per 100,000 population. This density is slightly above the French (7.42) and the German (6.88) value (see Table 15). Medical education and training is regulated by the Federal Law on Medical Professions (*Medizinalberufegesetz – MedBG*). After six years of medical education at university and passing the Federal Examination (*eidgenössische Prüfung*), students are granted the Federal Diploma of Medicine (*eidgenössisches Arztdiplom*), which enables them to work employed in a hospital or in a doctor's office. The diploma also qualifies for further education to become a specialist doctor [SDBB 2010a; SDBB 2011a]. Specialist training (residency) in ophthalmology takes 5 years [SIWF 2010] and leads to the corresponding specialist title (*eidgenössischer Weiterbildungstitel*), which is required for self-employment in a medical specialty.[114] The ophthalmologists' scope of practice comprises the investigation, diagnosis and therapy of eye diseases, including the determination and check of optical appliances [SDBB 2011a]. Qualified ophthalmologists can additionally undertake further specialist training in ophthalmic surgery, lasting two years [SIWF 2010].

[114] In addition to the specialist title, approval from the canton is required for self-employment; restrictions on admission differ between cantons [SDBB 2010a].

Augenoptiker EFZ[115] (previously: *gelernter Augenoptiker*) complete a 4 year apprenticeship as regulated in the corresponding vocational education and training ordinance (*Verordnung über die berufliche Grundbildung Augenoptiker EFZ*)[116], enacted by the Federal Office for Professional Education and Technology (*Bundesamt für Berufsbildung und Technologie*). Besides learning in the optical practice, apprentices also attend vocational school and take courses at the inter-company vocational training centre of the Swiss Optical Association (*Schweizer Optikerverband – SOV*) [SDBB 2010b; SOV 2011b]. Qualified *Augenoptiker EFZ* act as contact persons for non-medical vision problems. They sell spectacles and contact lenses based on the prescription issued by a *dipl. Augenoptiker,* an *Optometrist FH* or an ophthalmologist. *Augenoptiker EFZ* give advice to customers and do some technical work; they carry out small repairs or edge glasses [BBT 2010; SDBB 2010b]. *Augenoptiker EFZ* are not allowed to determine the optical correction nor to fit contact lenses. This requires a higher degree as *dipl. Augenoptiker* or *Optometrist FH* [SOV 2011b; SOV 2011c].[117] A higher degree is also required to work self-employed [SDBB 2010b].[118] Based on the competencies conferred on him, the *Augenoptiker EFZ* can be classified as dispensing optician.

The education system beyond the dispensing optician has changed in recent years. In 2007, a new bachelor programme in optometry superseded the traditional programme for becoming *eidgenössisch diplomierter Augenoptiker*, or often simply referred to as *dipl. Augenoptiker* [SDBB 2011b]. The traditional programme consisted of two years of training which the qualified dispensing optician completed at the former Swiss Professional Education and Training College for Optics (*Schweizerische Höhere Fachschule für Augenoptik*). As the final examination could not be taken before four years after completing the basic education as dispensing optician, it took in total eight years to become *dipl. Augenoptiker* [SOV 2011c; SOG 1994]. In contrast to the apprenticeship, which put emphasis on the basic technical knowledge, the training for *dipl. Augenoptiker* focussed on anatomy, pathology and physiology of the eye [SOV 2011c]. The examination to become *dipl. Augenoptiker* is supposed to be offered in September 2011 for the last time [SDBB 2011b].

[115] EFZ stands for '*Eidgenössisches Fähigkeitszeugnis*', i.e. Federal vocational education and training diploma.
[116] The vocational education and training ordinance about *Augenoptiker EFZ* came into force in 2011 and replaced the previous regulations about the apprenticeship and final apprenticeship examination of the *gelernter Augenoptiker* (*Reglement über die Ausbildung und die Lehrabschlussprüfung des gelernten Augenoptikers*). The old regulations also provided for a four year apprenticeship.
[117] This applies to practically all cantons and is regulated by the cantonal health care acts [SOV 2011c].
[118] The requirements for self-employment are determined by each canton; however, usually a higher degree is required [SDBB 2010b].

The new three year bachelor programme is run by the University of Applied Sciences *Nordwestschweiz* and leads to the degree *Optometrist FH*. Basis of this programme is the Federal Law on Universities of Applied Sciences (*Fachhochschulgesetz - FHSG*). Qualified dispensing opticians can enter the bachelor programme, provided they have a Federal Vocational Baccalaureate in engineering (*technische Berufsmaturität*). Applicants with a Federal Vocational Baccalaureate (*Berufsmaturität*) in another subject or a Baccalaureate (*gymnasiale Matura*) may also enter the bachelor programme if they have completed an internship at an optician store of at least one year duration [SDBB 2011b]. The programme is designed to provide students with optometric skills such as the determination of optical correction, contact lens fitting and binocular vision. Students also learn fundamentals of natural sciences and business management [FHNW 2011]. The scope of practice of the *Optometrist FH* is equal to that of the *dipl. Augenoptiker*; their tasks, rights and obligations are the same. They are allowed to determine the optical correction needed, i.e. prescribe glasses, and to fit contact lenses. If a pathological change is suspected or detected, they have the obligation to refer the customer to an ophthalmologist [SOV 2011c]. Based on the competencies conferred on them, the *dipl. Augenoptiker* and the *Optometrist FH* can be classified as optometrist, corresponding to category 3a of the WCO categories for optometric services [Grit 2008; SOV 2010].

The turnover of the Swiss optical market in 2009 is approximately 1.2 billion CHF (1.08 billion €), mainly generated by spectacles (70 %) and contact lenses including care products (20 %). About two third of the Swiss population is wearing spectacles or contact lenses [SOV 2009; SOV 2010]. There are about 1,100 optician shops and about 3,700 opticians [SOV 2010; SOV 2011d]. This corresponds to a density of 47.5 opticians per 100,000 population, which is well above the density of opticians in France (31.2), Germany (39.7) and the UK (28.5) (see Table 15). Approximately 25 % (925) of the Swiss opticians have a qualification as optometrist [SOV 2010]. At the beginning of 2010, 954 individuals were doing their apprenticeship to become *Augenoptiker EFZ* [SOV 2011d]. The proportion of sight tests performed by opticians in comparison to those performed by ophthalmologists is increasing. While in 1993, 54 % of tests were carried out by ophthalmologists and only 39 % by opticians, in 2009 opticians performed 59 % of all sight tests while ophthalmologists were responsible for 39 % [SOV 2009].

The following tables give an overview of the key facts on the three primary eye care providers in Switzerland.

Table 36: Key facts of primary eye care in Switzerland (I/II)

Country	Primary eye care providers	Officially acknowledged title	Profession	Headcount	Density per 100,000 population	Cursus	Length of studies	Educational setting
Switzer-land	Ophthalmologist	✓	Medical	600[1]	7.7[1]	6 years of medical education + 5 years of residency	11 years	University / hospital
	Dispensing optician	✓	Health care	~ 2.775	35.6	4 years aprenticeship (Augenoptiker EFZ)	4 years	Vocational school + Optician's premise
	Optometrist	✓	Health care	~ 925	11.9	3 year bachelor study subsequent to the qualification as Augenoptiker EFZ or to the completion of a 1 year internship at an optician store[2]	4 or 7 years[2]	University of Applied Sciences

[1] This refers to the number of ophthalmologists working in the outpatient sector. [2] Due to the fact that the last examination to become eidgenössisch diplomierter Augenoptiker is supposed to be offered in September 2011 for the last time, this traditional training route is not listed. It is of 8 years duration, including 4 years to become Augenoptiker EFZ.

Source: Institute for Health Care Management and Research based on HAS [2011]

Table 37: Key facts of primary eye care in Switzerland (II/II)

Country	Primary eye care provider	First point of care		Free and direct access possible	Qualified services						
		Refractive errors	Other ophthalmic troubles		Refraction	Prescription of glasses	Fitting of contact lenses	Sales of CL&Glasses	Eye examinations	Use of diagnostic agents	Use of therapeutic agents
Switzer-land	Ophthalmologist	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
	Dispensing optician	(✓)[1]	-	✓	-	-	-	✓	-	-	-
	Optometrist	✓	-	✓	✓	✓	✓	✓	(-)[2]	-	-

[1] As dispensing opticians and optometrists usually work in the same setting the dispensing optician is a possible first contact as well. Refractive services are typically provided by optometrists. [2] Without the capability of making medical diagnoses.

Source: Institute for Health Care Management and Research based on HAS [2011]

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Jean-Luc Dubié, Secretary General, Association des Optométristes de France

Interview ABDO College 2011:

Jo Underwood, Principal, ABDO College

Interview College of Optometrists 2011:

Dr Susan Blakeney, Optometric Advisor, College of Optometrists

Jacqueline Martin, Director of Education, College of Optometrists

Interview AOP 2011:

Geoff Roberson, Professional Adviser, Association of Optometrists

Interview GOC 2011a:

Linda Kennaugh, Head of Education and Standards, General Optical Council, Dispensing Opticians

Interview GOC 2011b:

Linda Kennaugh, Head of Education and Standards, General Optical Council, Optometrists

Interview BVA 2011:

Prof. Dr. Bernd Bertram, Chairman of the Executive Board, Berufsverband der Augenärzte Deutschlands

Christian Gante, Deputy Chief Executive, Berufsverband der Augenärzte Deutschlands

Interview ZVA 2011a:

Sven Schubert, Executive Board Member, Zentralverband der Augenoptiker

Interview ZVA 2011b:

Thomas Heimbach, Executive Board Member, Zentralverband der Augenoptiker

Interview VDCO 2011:

Prof. Dr. Manuel Fraatz, Chairmen of the Executive Board, Vereinigung Deutscher Contactlinsen-Spezialisten und Optometristen

Workshop ECOO 2011:

Wolfgang Cagnolati, DSc, Immediate Past President, European Council of Optometry and Optics

Richard Carswell, PhD, Former Secretary General, European Council of Optometry and Optics

Christian Müller, Vice President, Zentralverband der Augenoptiker

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