# CHAPTER 7

Discussion of results by cancer

In this chapter, we review the results presented in Chapters 4–6 for the 15 cancers diagnosed most commonly in sub-Saharan Africa (Fig. 7.01). For each cancer type, we present the following:
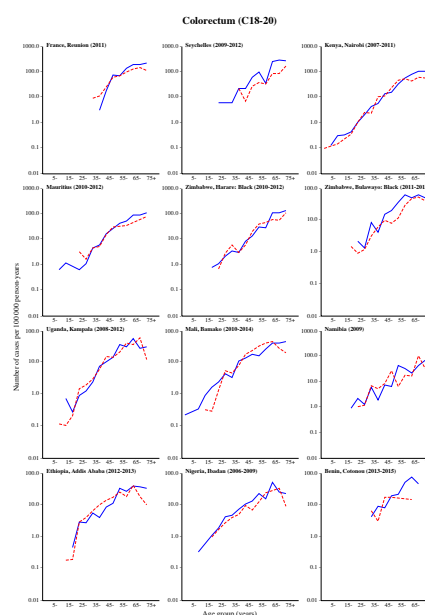
Cumulative incidence bar charts: These show the cumulative incidence rates up to and including the age of 74 years (expressed as percentages), by registry population, with separate charts for males and females. The bars are colour-coded by region: yellow for central Africa, red for eastern Africa (with hatching to differentiate the three Indian Ocean island populations: Mauritius, Réunion, and Seychelles), blue for southern Africa, and green for western Africa. For registries with so few cases of a given cancer that the 95% confidence interval for the cumulative incidence rate includes 0, the corresponding bars are omitted from the chart.
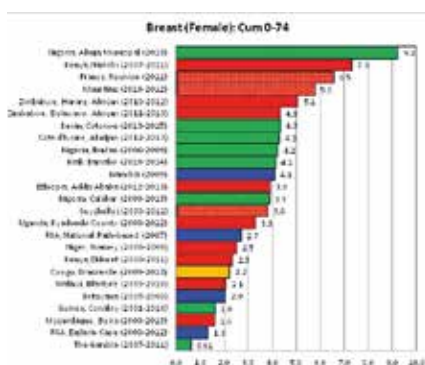
Cumulative risk maps: These show the cumulative risk of incidence up to and including the age of 74 years (expressed as a percentage) of the cancer, by country, for the whole of Africa. The rates shown are taken from the national estimates of incidence in GLOBOCAN 2012 (Ferlay et al., 2013).
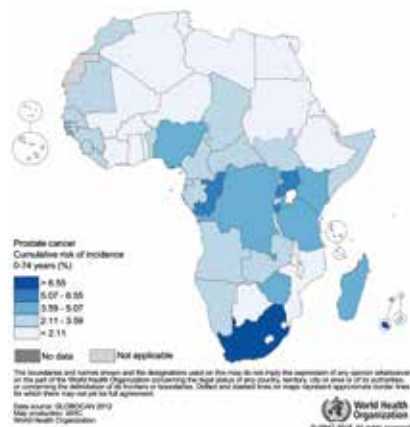
Age-specific incidence graphs: These show the age-specific incidence rates (expressed as cases per 100 000 person-years) in males (solid blue lines) and females (dashed red lines), by registry population. The age-specific rates for Abuja (Nigeria) were not included, given that the sparse data meant that the curves were difficult to interpret.

For each cancer, there is also a brief discussion of the data presented in these three figures, including some pertinent references relating to the reasons for observed differences, some notes on the possible future evolution of the cancer in Africa, and relevant prevention strategies.
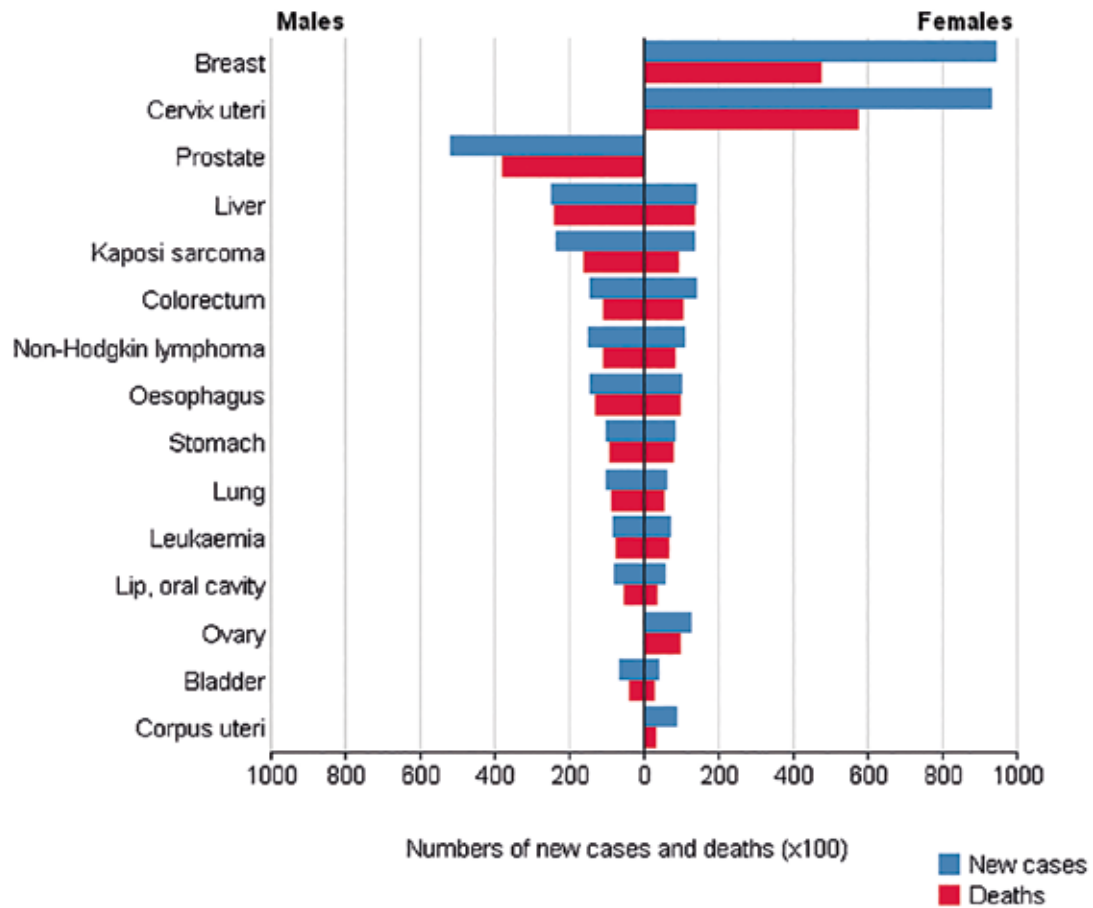
Fig. 7.01. The 15 cancers diagnosed most commonly in sub-Saharan Africa: numbers of new cases and deaths in 2012, by sex

Cancer of the breast

Fig. 7.02 shows the cumulative incidence rates of breast cancer (among females) observed in each of the registry populations of sub-Saharan Africa included in this volume.
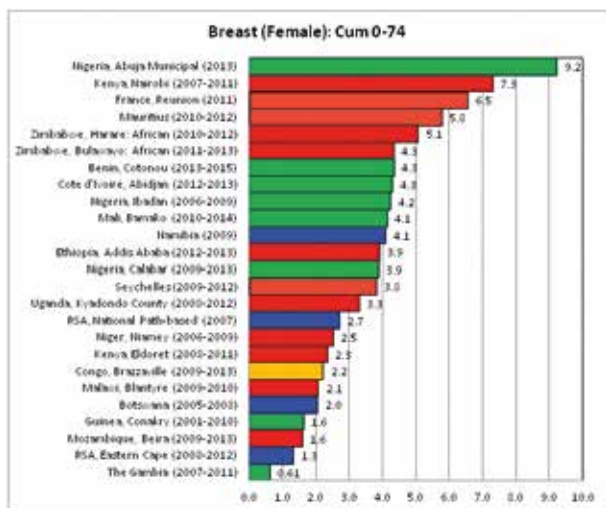

Fig. 7.02. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the breast among females in sub-Saharan Africa, by registry population

Breast cancer was the most commonly diagnosed cancer in females in sub-Saharan Africa in 2012 (with an estimated 94 000 new cases) and was also the leading cause of death from cancer that year. It is the most common cancer among women in 26 (about one half) of the 54 countries in Africa (Fig. 7.03).
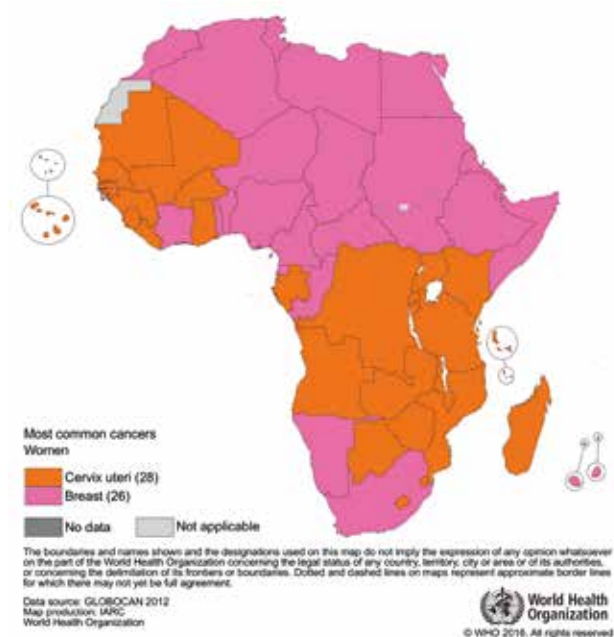

Fig. 7.03. The most common cancers in women in Africa, by country

The incidence of breast cancer in Africa is generally relatively low; most of the registries report a cumulative incidence rate of < 5% in females, compared with 9.6% in the Black population of the USA in 2003–2007 (Forman et al., 2014).

The geographical pattern of high- and low-incidence countries in sub-Saharan Africa does not closely follow the conventional regions. The highest incidence is that reported in Abuja (Nigeria). Then, apart from the island populations of Mauritius and Réunion (France), the highest rates are seen in Nairobi (Kenya) and in the Black population of Harare and Bulawayo (Zimbabwe).

The lowest recorded incidence rates are in the rural populations of Eastern Cape (South Africa) and The Gambia.

The map for the whole of Africa using GLOBOCAN 2012 data (Fig. 7.04) shows that breast cancer incidence rates vary substantially; apart from the island populations of Mauritius and Réunion (France), the highest rates are seen in Nigeria, Ethiopia, Egypt, Algeria, and South Africa.
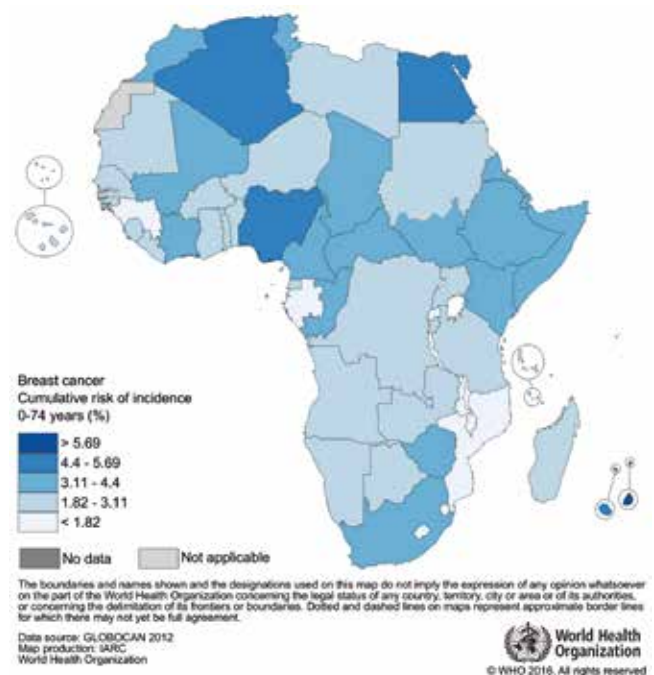

Fig. 7.04. Cumulative risk (up to and including the age of 74 years) of cancer of the breast among females in Africa, expressed as a percentage, by country

Fig. 7.05 shows the age-specific incidence rates of breast cancer in the contributing registries of sub-Saharan Africa. The rates in older age groups show little increase with age and, in some series, an apparent decrease with age. This almost certainly represents a cohort (or generational) effect that is the consequence of increasing risk of breast cancer in successive generations. There have been rapid increases in the incidence of breast cancer in sub-Saharan Africa;

rates of increase during the past 20 years were 3.6% per year in Kampala (Uganda) (Wabinga et al., 2014) and 4.9% per year in the Black population of Harare (Zimbabwe) (Chokunonga et al., 2013). A report from the rural registry of Eastern Cape (South Africa) showed an annual increase of 4.3% over the 15-year period since 1998 (Somdyala et al., 2015). These changes are most marked in postmenopausal women, and are most likely to be associated with declining fertility in successive generations of African women (Corbex et al., 2014), as well as changing lifestyles with respect to, for example, increasing prevalence of overweight or obesity, declining levels of physical activity, reduced prevalence and duration of breastfeeding, and, possibly, increasing alcohol consumption. The roles of these risk factors in sub-Saharan Africa are discussed in more detail below.

The young age structure of African populations, coupled with the relatively flat cross-sectional age-specific incidence curves in postmenopausal age groups (Fig. 7.05), means that the average age at diagnosis is lower in Africa than in populations in North America and Europe. This early age at diagnosis is often mentioned in clinical series from Africa, but has no etiological significance (Corbex et al., 2014). Nevertheless, Black females in the USA do have a slightly higher incidence of breast cancer at young ages (< 45 years) than White females in the USA (Howlader et al., 2014; Newman, 2014).

STAGE AND SURVIVAL

In Africa, tumour stage at presentation is generally advanced (Islami et al., 2015), and an association between tumour stage and distance to health services has been shown (Dickens et al., 2014). Most T3 tumours will already have developed metastasis at the time of diagnosis. Follow-up studies of unselected patients diagnosed with breast cancer in 1993–1997 have been completed in Harare (Zimbabwe) and Kampala (Uganda) (Gondos et al., 2004, 2005). In Harare, 5-year survival in Black (African) females was 38%, compared with 74% in White females in the same city, and 45% in Black (African) females in Kampala. In the USA, there are extensive data on breast cancer incidence, mortality, and survival by ethnicity. These data show that Black females are diagnosed with later-stage disease and have poorer survival, even within stage groups, than White females (Howlader et al., 2015).

BIOLOGY

Differences in the biology of breast carcinomas between Black and White females have been sought to explain these findings. There is little or no evidence for differences in histopathological type (Middleton et al., 2003). However, tumours in Black females in the USA are more likely to be estrogen receptor (ER)–negative and of a higher grade than those in White females in the USA (Chu & Anderson, 2002; Jemal & Fedewa, 2012). The same is true in the Black population of the United Kingdom (Bowen et al., 2008). Aggressive clinical features such as triple-negative and inflammatory disease have frequently been documented in clinical series from Africa. A probable reason that the relative proportions are high is because of the lower incidence of other forms of breast cancer (Corbex et al., 2014). Case series from several centres

in Africa have reported that hormone receptor–negative cases are predominant. In a recent meta-analysis, Eng et al. (2014) found that, in prospectively collected specimens, the pooled proportions were 0.59 (95% confidence interval: 0.56–0.62) for ER-positive tumours and 0.21 (95% confidence interval: 0.17–0.25) for triple-negative tumours. However, they noted the low methodological quality of many studies in terms of the representativeness of the case series and the quality of the procedures for collection, fixation, and receptor testing, which undoubtedly influenced many of the results.

RISK FACTORS

The incidence in White females living in Africa is much higher than in Black females; the difference for histologically diagnosed cancers in South Africa in 1998–1999 was about 4-fold (Norman et al., 2006). Very high incidence rates were recorded in the White population of Harare in 1990–1992 (an age-standardized incidence rate of 127.7 per 100 000) (Bassett et al., 1995), but the risk differential in Harare is decreasing, reflecting the rising incidence rates in the Black population (Chokunonga et al., 2016).

Family history has been shown to be a marker of breast cancer risk in the African setting (Okobia et al., 2006; Rosenberg et al., 2002). Part of this risk is mediated by the major susceptibility genes *BRCA1* and *BRCA2* (about 2% of breast cancer cases in Europe), but although several distinct mutations in these genes have been identified in Black people in the USA, very little is known about the prevalence of these mutations in African populations (Oluwagbemiga et al., 2012). Because of the great genetic diversity throughout Africa (Gomez et al., 2014), evidence will remain limited until genetic testing is easily accessible. A genome-wide association study in women of African ancestry in the USA has suggested the possibility of some distinctive common variants associated with breast cancer, compared with European populations (Chen et al., 2013).

Breast cancer risk is also related to menstrual and reproductive factors, high body mass index (BMI), high alcohol consumption, low levels of physical activity, and exposure to exogenous hormones either as contraceptives or as postmenopausal hormone replacement therapy. A recent review by Brinton et al. (2014) provided a useful summary of knowledge about the role of these risk factors in breast cancer risk in sub-Saharan Africa.

With respect to reproductive and hormonal factors, increases in risk are reported with advanced age at first pregnancy or delivery, low parity, and late age at menarche (Adebamowo & Adekunle, 1999; Huo et al., 2008; Rosenberg et al., 2002). As in developed countries, body size (including height, body mass, and waist–hip ratio) has been shown to relate to breast cancer risk in sub-Saharan Africa (Ogundiran et al., 2010; Okobia et al., 2006). Physical activity levels vary greatly across African countries and population subgroups; this is mostly related to work (including housework) and transportation, whereas physical activity during leisure time appears to be rare (Guthold et al., 2011). Breast cancer risk (in both premenopausal and postmenopausal women) was significantly associated with reduced physical activity

in a case–control study in three countries: Cameroon, Nigeria, and Uganda (Hou et al., 2014).

Although most African women are lifetime abstainers, the prevalence of alcohol consumption varies widely and is, in general, increasing (Martinez et al., 2011). In the three-country study mentioned above, Qian et al. (2014) found a positive relationship between alcohol consumption and breast cancer risk, with a dose–response relationship observed for duration of alcohol consumption.

Breastfeeding is now thought to protect against breast cancer, and two thirds of the difference in breast cancer incidence between developed and developing countries has been estimated to be attributable to breastfeeding (Collaborative Group on Hormonal Factors in Breast Cancer, 2002). Although some studies in Africa have found no association (Coogan et al., 1999), a study in Nigerian women found that breast cancer risk decreased by 7% for every 12 months of breastfeeding (Huo et al., 2008).

As with most cancers, attempts have been made to link risk to HIV status. A hospital-based study in South Africa found similar rates of HIV-positive cases among breast cancer patients and among the general population (Cubasch et al., 2013).

Brinton et al. (2014) also speculated about the possible role of microbiomes, compromised immune status (due to infections or exposure to chemicals such as insecticides), environmental estrogens, and the widespread use of skin lighteners and hair relaxers by African women.

EARLY DETECTION
Mammography screening can reduce mortality from breast cancer (IARC, 2002). In Africa, resources are lacking and mammography is not useful for a predominantly premenopausal population. Because hospital case series have shown markedly better outcomes in early-stage disease, earlier detection through improved awareness is a logical approach to reducing mortality (Kantelhardt et al., 2014).

Physical examination by health care workers has been advocated as a screening modality. To date, there are no randomized trials of the effectiveness of physical examination in reducing mortality. In Sudan, trained volunteers screened 70% of a target population of 15 000 women. They found 138 breast masses with 4 early-stage and 5 advanced breast cancers, compared with 1 early-stage and 3 advanced cases self-reported by women in the control villages (Abuidris et al., 2013). In the United Republic of Tanzania, a similar intervention led to an increase in the number of early-stage breast cancers, over a 3-year period, from 9% to 67% (Ngoma et al., 2015). The feasibility and costs of such programmes need further investigation.

TREATMENT
To the clinician, breast cancer presents as a different disease in Africa compared with in developed countries, with predominantly young patients and advanced-stage tumours typical of low-resource settings. Open questions exist about how to decentralize palliative care (Cardoso et al., 2013), how to optimize neoadjuvant treatment, how to scale up the use of endocrine treatment, and how best to use scarce radiotherapy facilities (Abdel-Wahab et al., 2013). Several organizations, such as the Breast Health Global Initiative and the National Comprehensive Cancer Network, have developed and published resource-stratified guidelines to take this situation into account (Anderson, 2014; National Comprehensive Cancer Network, 2015).

CONCLUSION
The rapid growth and ageing of the African population, and changes in reproductive habits and lifestyles, will mean that breast cancer becomes an even more important problem than at present. Prospects for preventing this increase seem slim, and undoubtedly the challenge will be how to achieve earlier diagnosis and provide adequate treatment, already a major challenge for resource-poor health services.
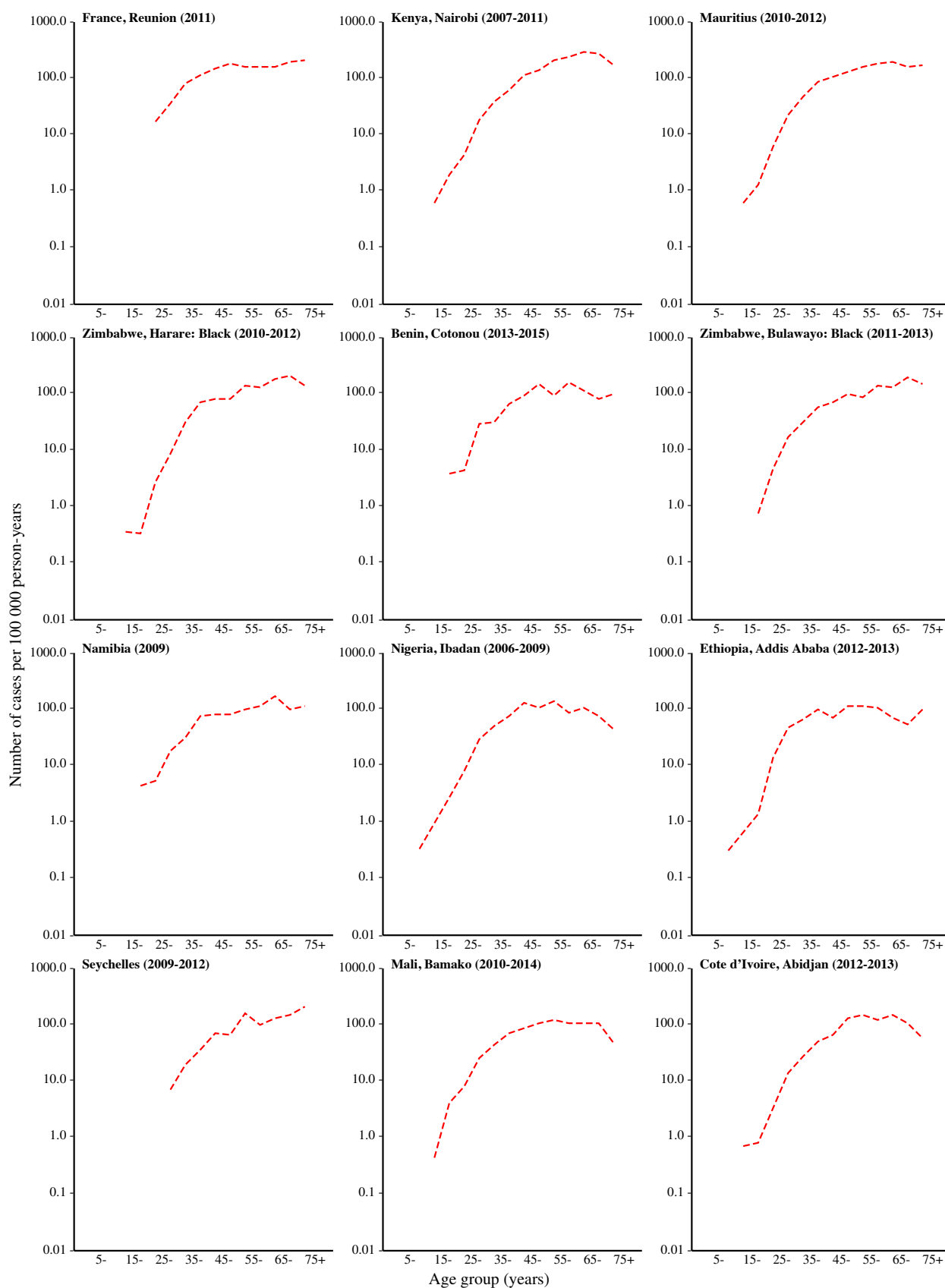
Breast (C50): females

Fig. 7.05. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the breast among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
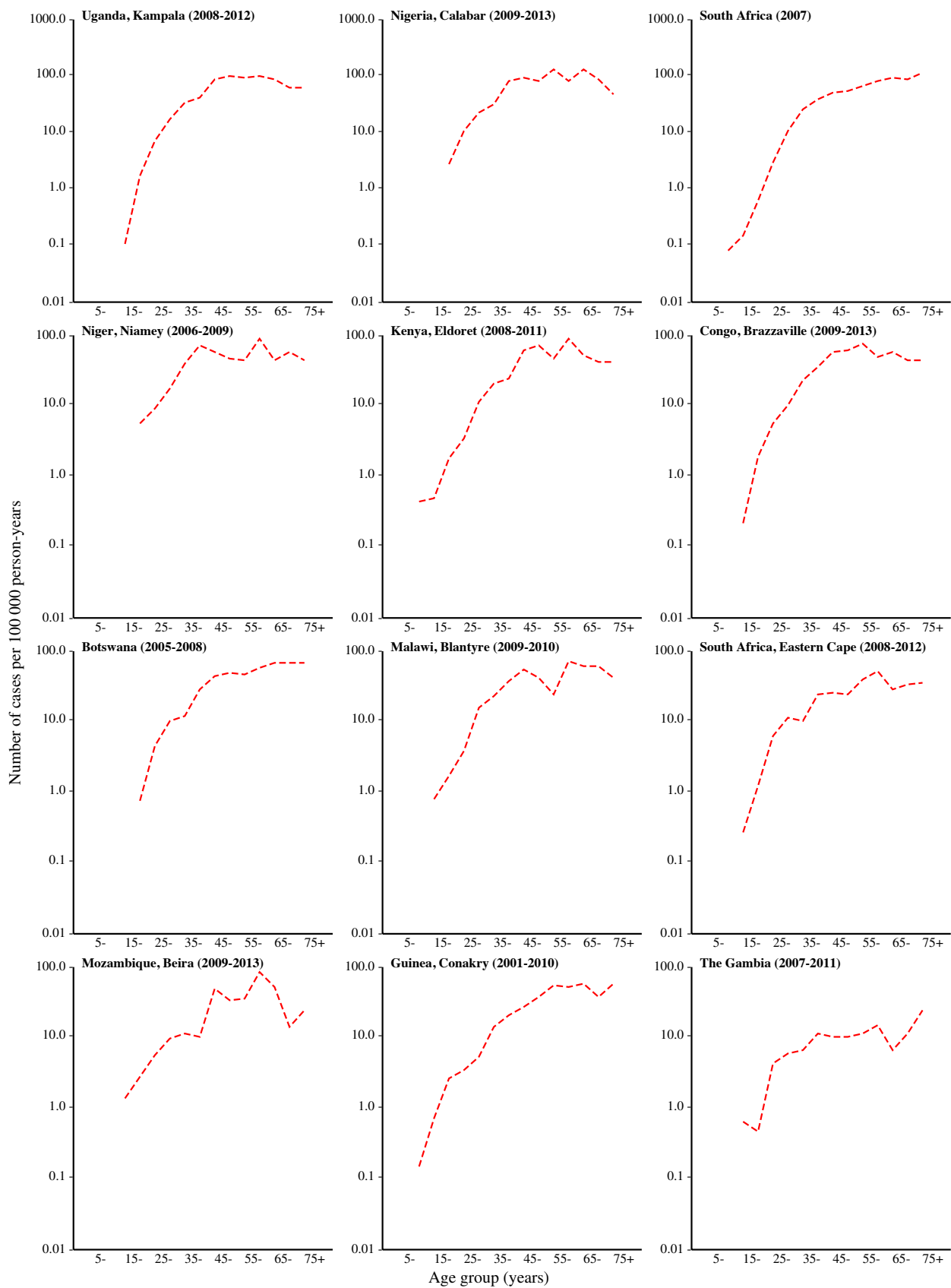
Breast (C50): females

Fig. 7.05 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the breast among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the cervix uteri

Fig. 7.06 shows the cumulative incidence rates of cervical cancer observed in each of the registry populations of sub-Saharan Africa included in this volume.
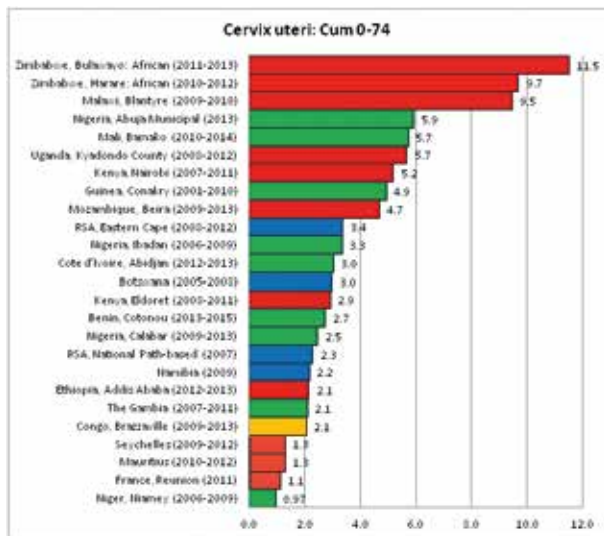

Fig. 7.06. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the cervix uteri among females in sub-Saharan Africa, by registry population

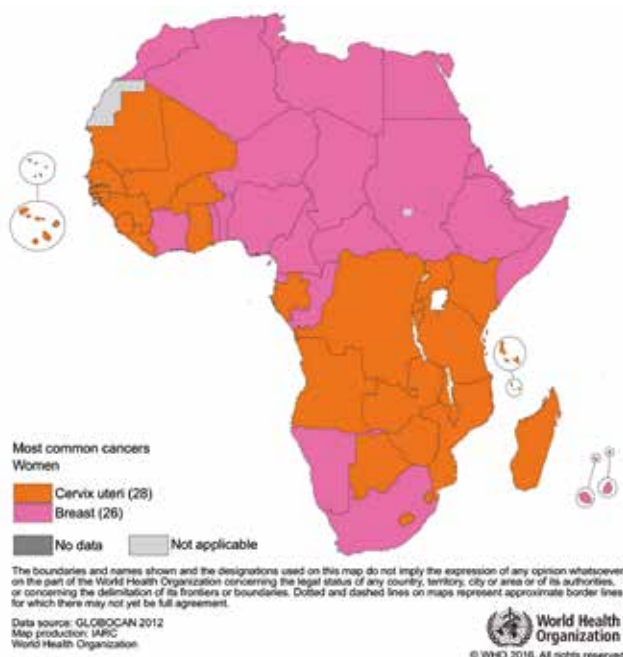About 99 000 newly diagnosed cervical cancer cases and 60 000 deaths from cervical cancer were estimated to have occurred in 2012 in Africa (Ferlay et al., 2013). Cervical cancer is the most frequently diagnosed cancer in 28 of the 54 countries in Africa (Fig. 7.07) and the leading cause of death in 30 countries, accounting for about 30% of total cancer cases and deaths in the region.

The cumulative incidence rates of cervical cancer up to and including the age of 74 years, expressed as percentages, vary substantially, from < 1% in Egypt and Niamey (Niger) to almost 12% in the Black population of Bulawayo (Zimbabwe) (Fig. 7.06). This variation reflects, in part, differences in the prevalence of chronic human papillomavirus (HPV) infection, the major risk factor for cervical cancer; the availability and use of early detection services; and coinfections with HIV, which increases the likelihood of chronic HPV infection and progression of precancerous lesions to cancer (Denny et al., 2012).
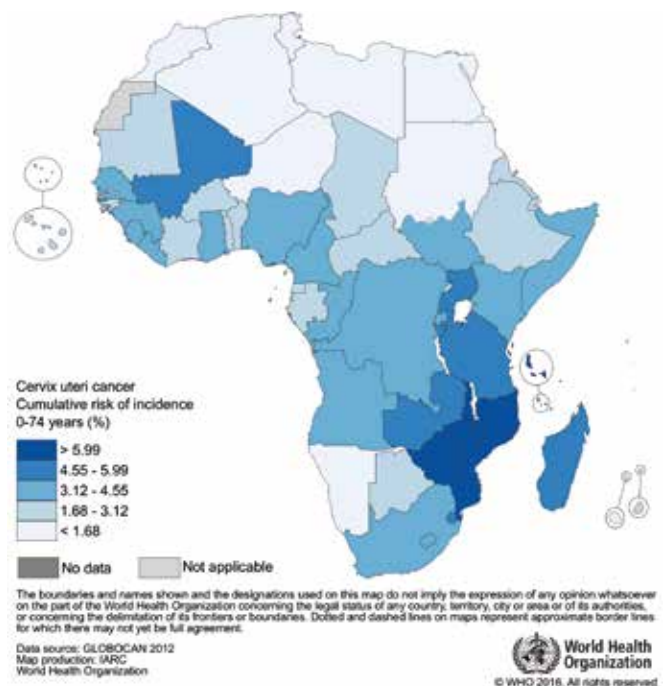

Fig. 7.08. Cumulative risk (up to and including the age of 74 years) of cancer of the cervix uteri among females in Africa, expressed as a percentage, by country

Fig. 7.07. The most common cancers in women in Africa, by country

Fig. 7.09 shows age-specific incidence rates. In general, rates increase with age. This contrasts with the pattern commonly seen in developed countries (e.g. the USA), where rates peak at ages in the early 40s, probably due to the removal of precancerous lesions in middle age through screening (Howlader et al., 2013). However, it is noteworthy that before the introduction and increasing use of Pap testing after the middle of the 20th century, cervical cancer incidence rates in the USA were as high as those found in eastern Africa today (Dorn & Cutler, 1959). In addition to the high incidence rates, most cervical cancer patients in sub-Saharan Africa are diagnosed at late stages of the

disease, when the treatment options are limited and survival is poor, largely because of the lack of screening services (Lim & Ojo, 2017). Five-year survival in sub-Saharan Africa for patients diagnosed and treated in the 1990s ranged from 18% in Uganda to 31% in the Black population of Zimbabwe (Gondos et al., 2004, 2005), compared with > 80% in developed countries (Allemani et al., 2015).

Furthermore, the burden of cervical cancer in sub-Saharan Africa, as measured by the age-standardized incidence rate, appears to be increasing rather than decreasing, based on data from three recent studies in Harare (Zimbabwe) (Chokunonga et al., 2016), Kampala (Uganda) (Wabinga et al., 2014), and rural Eastern Cape (South Africa) (Somdyala et al., 2015). The reasons for this increase are unknown, but the increase may, in part, reflect improved survival of people with HIV as a result of better access to highly active antiretroviral therapy (HAART), and greater opportunity for precancerous cervical lesions to progress to cancer. In the USA, recent increases in the risk of HIV-defined cancers (anal cancers) and non-defined cancers (cancers of the colorectum and liver) among people with HIV, in part due to decreased mortality from HIV, have been noted (Silverberg et al., 2015).

Major preventive measures for cervical cancer include HPV vaccination and screening. Vaccines that protect against HPV 16 and HPV 18 infections, which cause 70% of cervical cancers, have been commercially available since 2006. An improved vaccine that protects against nine types of oncogenic HPV, which cause 90% of cervical cancers, was approved for commercial use in 2014. In 2014, WHO recommended vaccination of girls aged 9–13 years (before the onset of sexual activity) with two doses of the vaccine administered 6 months apart (WHO, 2014). Major barriers to the introduction of the vaccine in sub-Saharan Africa include cost and accessibility (Cunningham et al., 2014; Perlman et al., 2014; Sankaranarayanan et al., 2013). In 2011, GAVI negotiated a lower price ($5 per dose) with the vaccine manufacturers to facilitate the introduction of the vaccine in low- and middle-income countries, where the disease burden is highest and the vaccine is most needed. As of August 2015, the vaccine had been introduced in six countries in sub-Saharan Africa (Botswana, Lesotho, Rwanda, Seychelles, South Africa, and Uganda) as part of national immunization programmes to vaccinate pre-adolescent girls in schools. The vaccine was also introduced in several other countries as demonstration projects. Reported three-dose coverage ranged from 73% in Uganda to 93% in Rwanda (Binagwaho et al., 2012; Mugisha et al., 2015; Raesima et al., 2015), rates that are high enough to provide herd immunity (Drolet et al., 2015).

Cytology screening has been credited with the dramatic decrease in cervical cancer rates in developed countries, with rates decreasing by > 70% in several Scandinavian countries (Vaccarella et al., 2014). However, population screening by cytology testing in Africa has been impeded by weak health care infrastructure and lack of trained personnel, as well as by the need for multiple health facility visits (Lim & Ojo, 2017; Sankaranarayanan et al., 2013). According to a recent review, the coverage of cervical cancer screening in sub-Saharan Africa ranged from 2% to 20% in urban areas, and from < 1% to 14% in rural areas (Louie et al., 2009). However, in the past two decades, alternative screening approaches that have proven to be effective for use in low-resource settings have been developed (Denny et al., 2005; Sankaranarayanan et al., 2016). These approaches include visual inspection with acetic acid (VIA) or visual inspection with Lugol's iodine (VILI) and HPV DNA testing for detecting lesions, followed by cryotherapy on the same day, in what is known as the "single visit" or "screen and treat" approach. Several countries in sub-Saharan Africa have introduced cervical cancer screening programmes using these approaches at the national level (e.g. Rwanda); others have introduced them at the subnational level (Binagwaho et al., 2013). Other innovative strategies that have been explored to improve women's participation in screening include screening of women attending HIV clinics (Kahesa et al., 2008) and inviting mothers of daughters receiving HPV vaccinations at school to participate in self-screening using HPV testing by taking a self-screening kit home (Snyman et al., 2015). In addition to increasing coverage of HPV vaccination and screening of women, the burden of cervical cancer in sub-Saharan Africa could be reduced by comprehensive control of HIV infections.
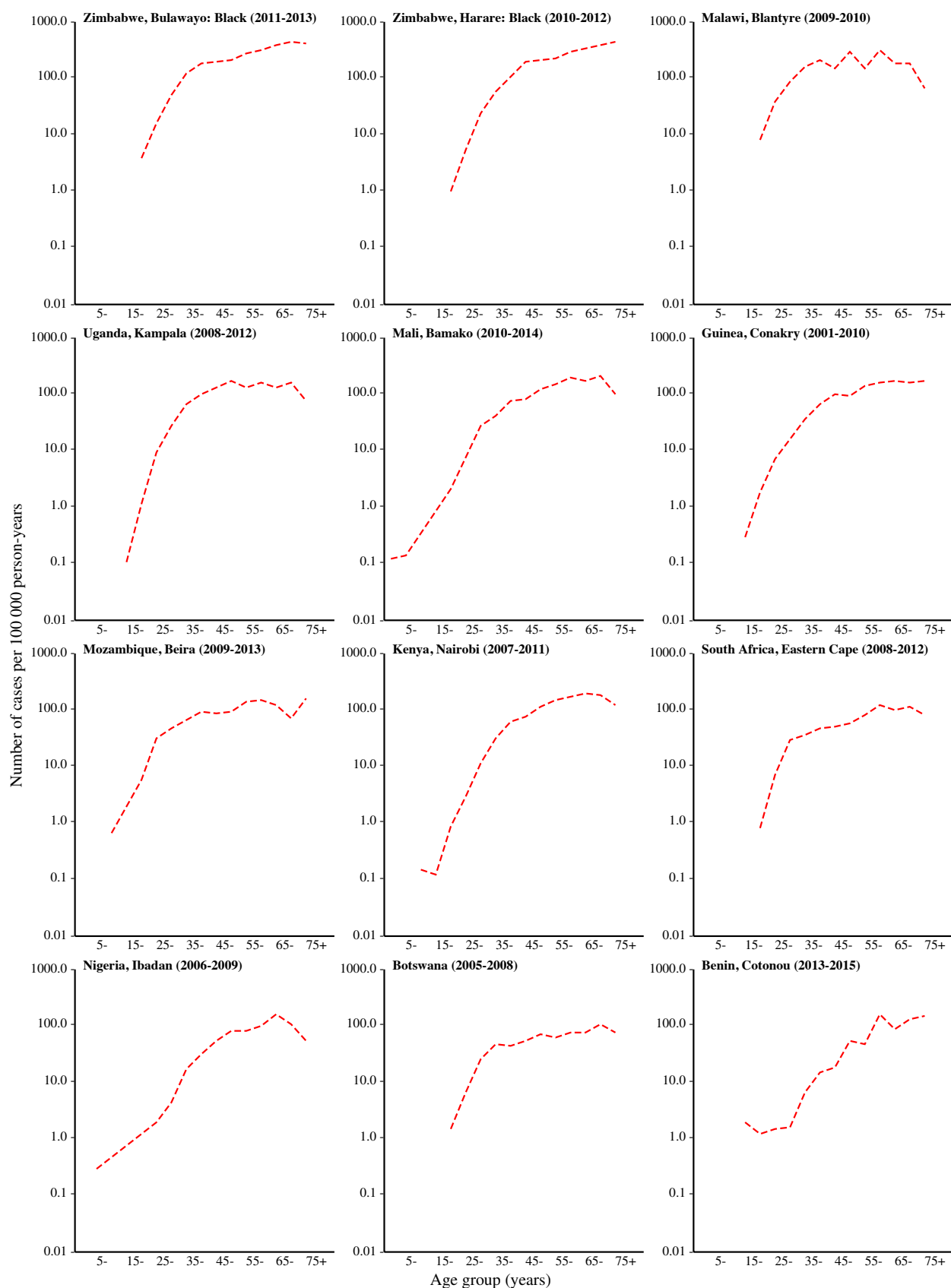
Cervix uteri (C53)

Fig. 7.09. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the cervix uteri among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
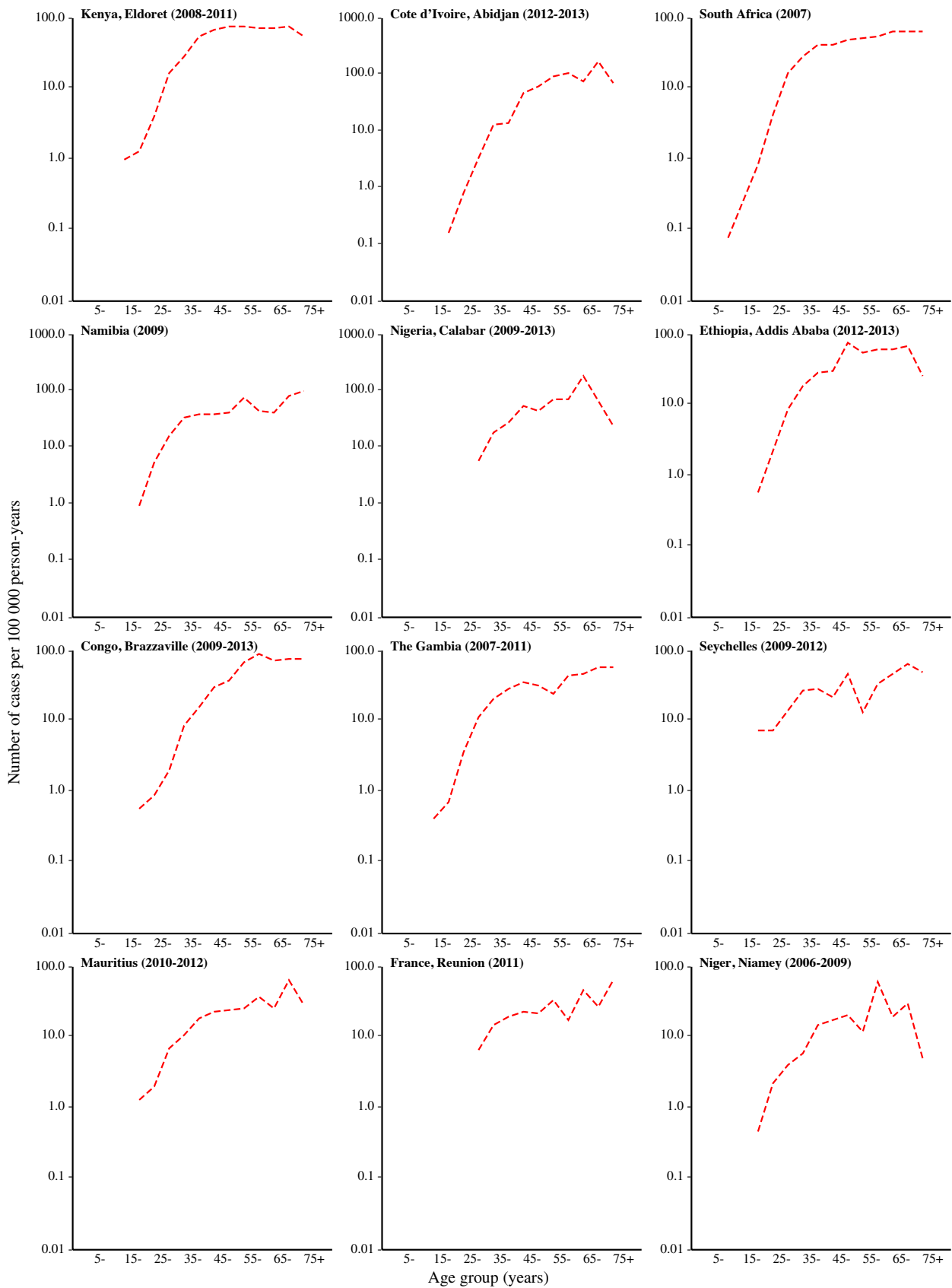
Cervix uteri (C53)

Fig. 7.09 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the cervix uteri among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the prostate

Prostate cancer is the most frequently diagnosed cancer in men in sub-Saharan Africa, and the third most common neoplasm overall (after breast cancer and cervical cancer), with almost 52 000 new cases and 38 000 deaths estimated to have occurred in 2012 (Fig. 7.01). The average risk that a man in sub-Saharan Africa will develop prostate cancer before the age of 75 years is 3.4%, meaning that it affects almost 1 in 30 men. This rate is similar to the equivalent risks for breast cancer (3.5%) and cervical cancer (3.8%) in women.
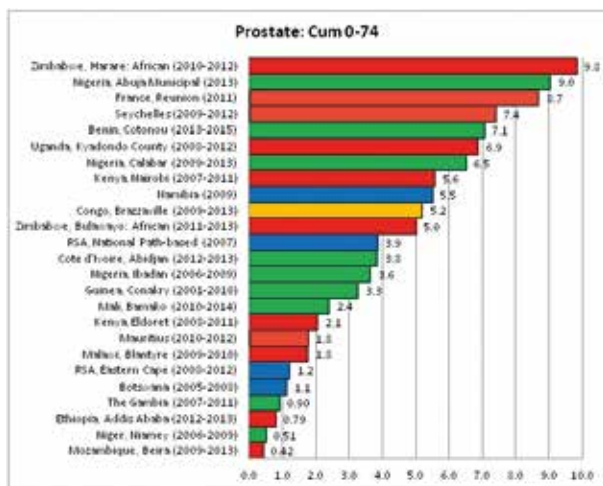

Fig. 7.10. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the prostate among males in sub-Saharan Africa, by registry population

Prostate cancer is the leading cause of cancer among men in 23 of the 54 countries in Africa (Fig. 7.11).

The cumulative incidence rates reported by the registries in this volume vary widely, from almost 10% in the Black population of Harare (Zimbabwe) to < 1% in The Gambia and Addis Ababa (Ethiopia) (Fig. 7.10). There are no clear geographical differences between the regions of Africa. The estimated incidence rates in GLOBOCAN 2012 show a 10-fold variation in cumulative incidence of prostate cancer in countries in sub-Saharan Africa (Fig. 7.12), with risk ranging from 0.8% in Ethiopia to > 8% in South Africa in 2012.

Fig. 7.13 shows age-specific incidence rates in 24 registry populations. The risk increases very steeply with age, and, as has been noted for many years, this rate of increase is considerably greater than for other epithelial cancers (Cook et al., 1969). The young age of African populations means that the average age at diagnosis is lower in Africa than in populations in Europe and North America. This is often noted in clinical series from Africa, although the curves of incidence versus age are very similar to those observed elsewhere.

In South Africa, the incidence rates of histologically diagnosed prostate cancer in White men have been much higher than the rates in Black men (Norman et al., 2006), in part due to the lack of access to
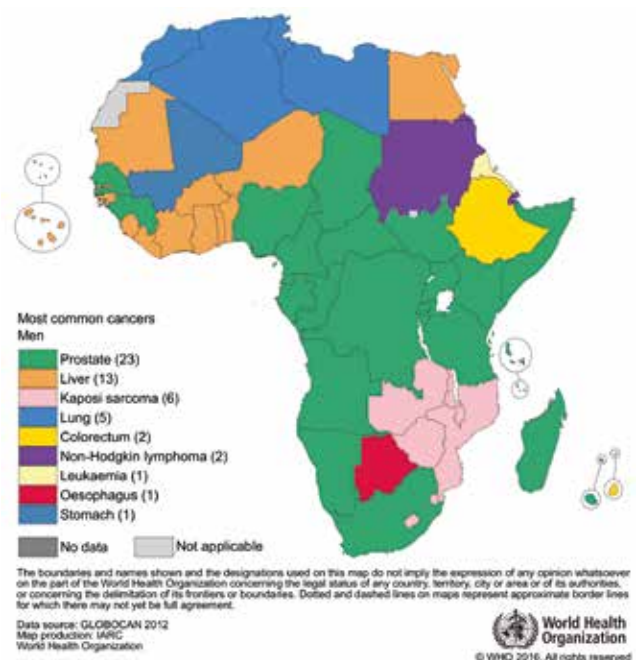

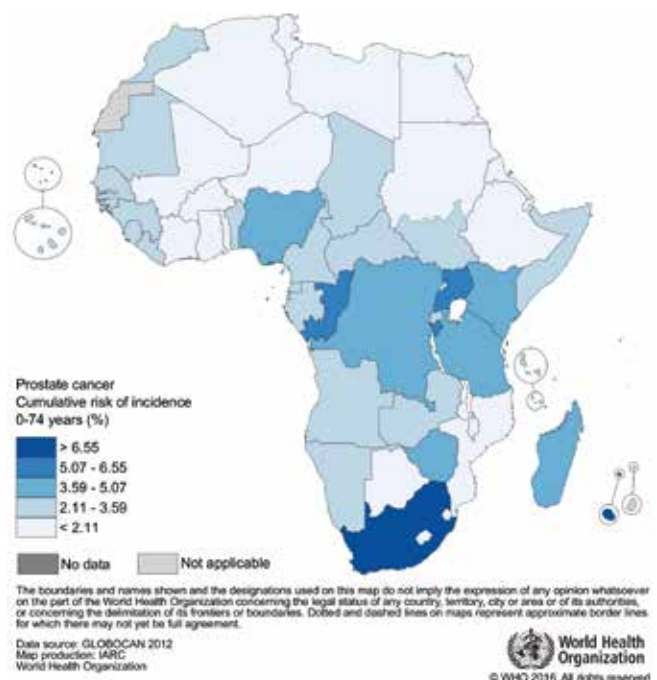Fig. 7.11. The most common cancers in men in Africa, by country

Fig. 7.12. Cumulative risk (up to and including the age of 74 years) of cancer of the prostate among males in Africa, expressed as a percentage, by country

diagnostic and screening facilities for Black men. However, the incidence of prostate cancer in Black men in Harare has been rising rapidly, at a rate of 6.4% per year during the period 1991–2010 (Chokunonga et al., 2013), and the risk is now higher in Black men in

Harare than in the White population (Chokunonga et al., 2016). Incidence rates are increasing significantly in Kampala (Uganda), at 3.7% per year (Wabinga et al., 2014), and in the rural population of Eastern Cape (South Africa) (Somdyala et al., 2015). These increases are certainly not due to screening, although it is likely that increased awareness, a greater readiness to perform prostatectomy for urinary symptoms in elderly men, and histological examinations of operative biopsies have played a role. Most cancer registries are located in major cities or urban populations in Africa, and therefore it remains difficult to ascribe such geographical and temporal differences to risk factors linked to increasing affluence (a transition to a lifestyle typical of industrialized countries) or to inherent and well-known artefacts (enhanced diagnostic capabilities, notably via the increasing availability and affordability of prostate-specific antigen [PSA] testing).

The relatively high incidence and mortality recorded in African populations is reflected in populations of African descent elsewhere in the world. Thus, within the USA, incidence rates in the Black population have been higher those in the White population for several decades, despite more intensive PSA screening in the White population (Howlader et al., 2015). In the islands of the Caribbean, which are populated largely by descendants of people from western Africa, the mortality rates are some of the highest in the world (Rebbeck et al., 2013). In São Paulo, Brazil, the risk of prostate cancer in Black males was 1.8 (95% confidence interval: 1.4–2.3) times that in White males (Bouchardy et al., 1991), and in England the incidence among Black males was more than twice the incidence among White males (Maruthappu et al., 2015).

The reasons underlying this higher risk of prostate cancer in men of African origin have been the subject of intense research efforts. It seems unlikely that the higher risk is due to differences in environmental exposures (including lifestyle factors) (Mordukhovich et al., 2011). Possible variations in single-nucleotide polymorphism patterns of the genes of the enzymes involved in androgen biosynthesis and metabolism (e.g. CYP17 and CYP3A4), in vitamin D synthesis, and in regulating cell apoptosis (e.g. BCL2), and polymorphisms at 17q21, 11q13, and 8q24 may be involved. Epigenetic changes and variations in fusion-gene products among men of African origin may also be involved in the genetic differences underlying this disease (Hatcher et al., 2009; McGinley et al., 2016).
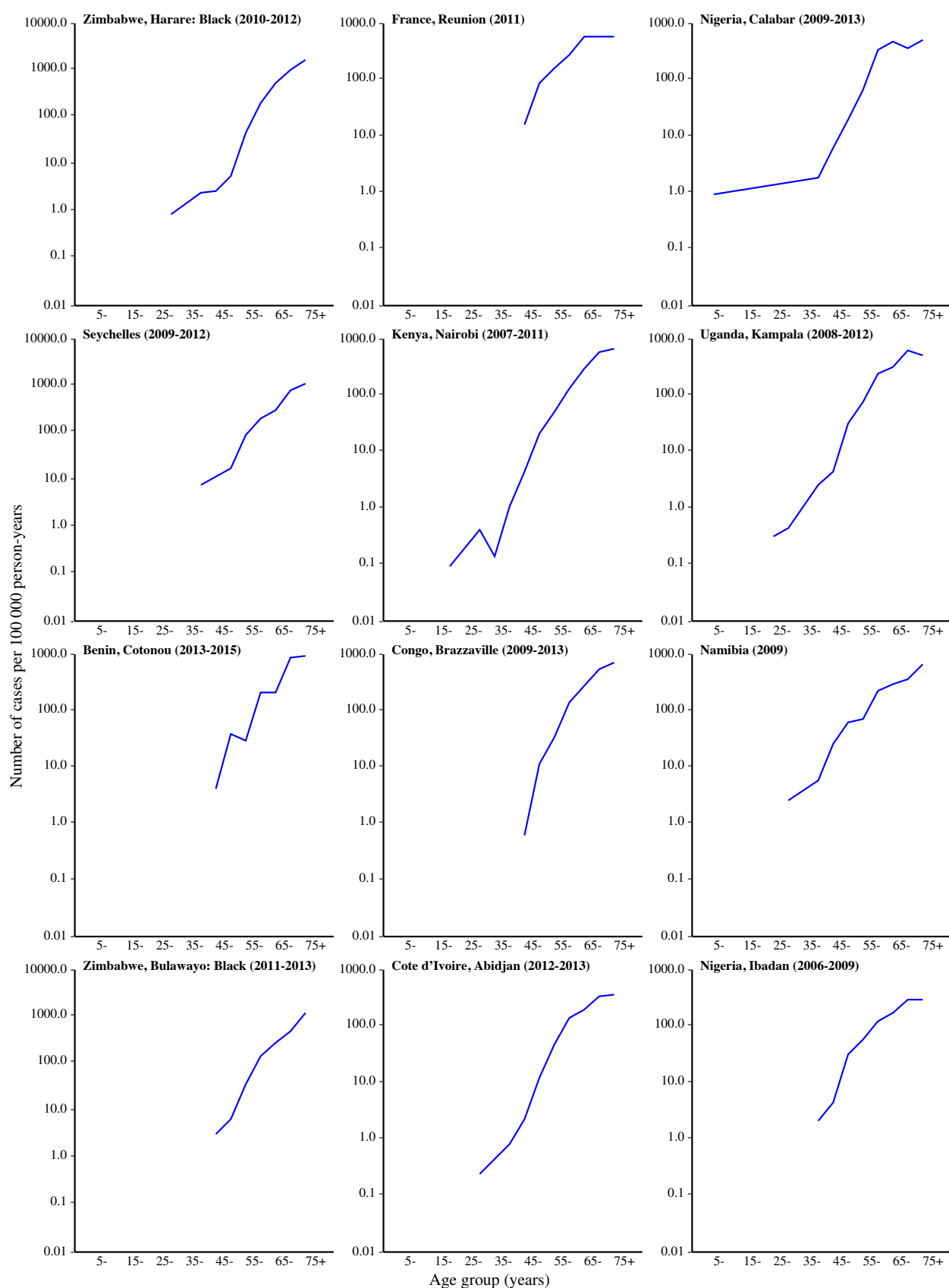
Prostate (C61)

Fig. 7.13. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the prostate among males in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
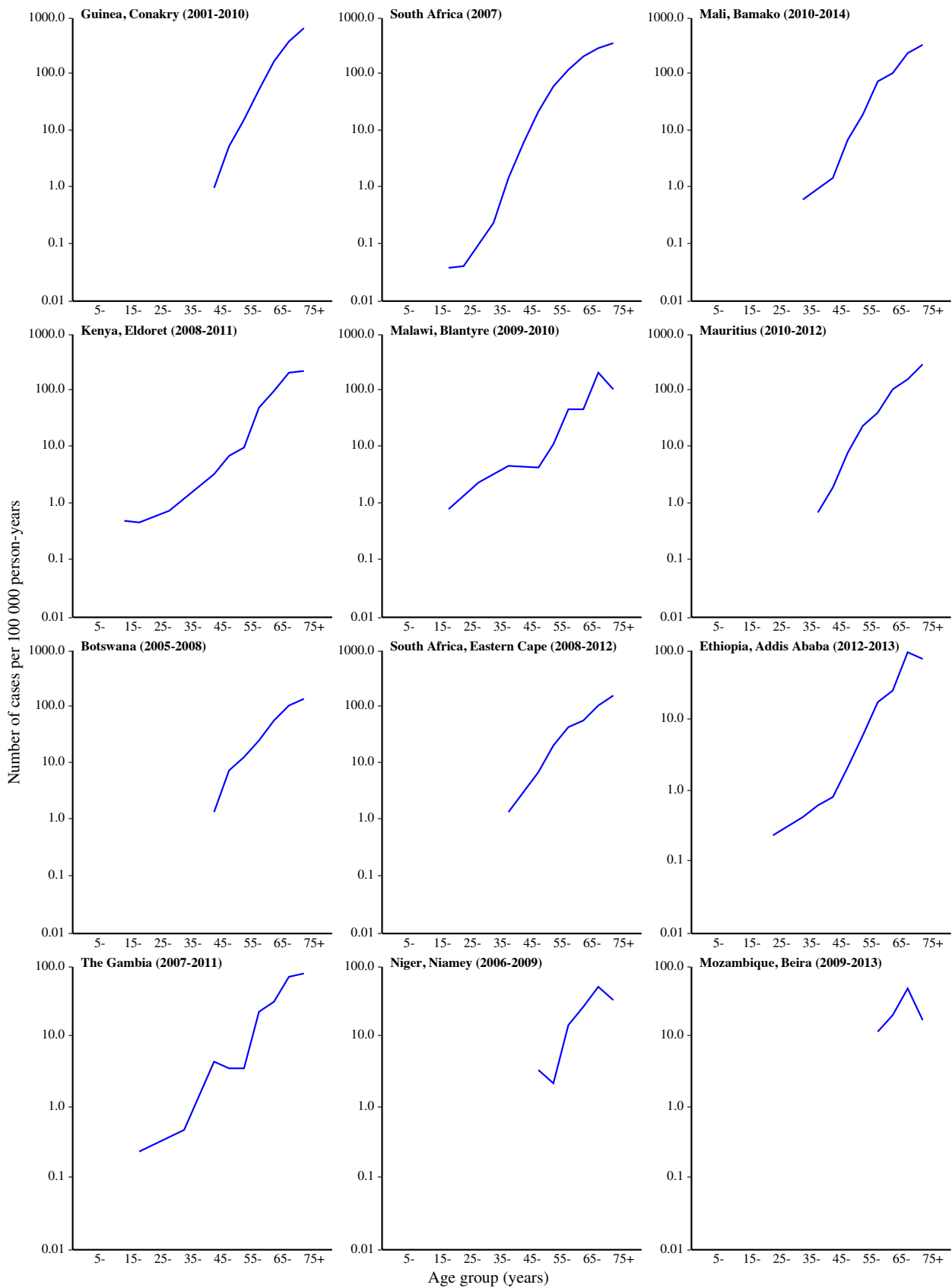
Prostate (C61)

Fig. 7.13 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the prostate among males in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the liver

About 59 000 newly diagnosed liver cancer cases and 56 000 deaths from liver cancer (predominantly hepatocellular carcinoma) were estimated to have occurred in 2012 in Africa, and > 67% of these cases and deaths occurred in sub-Saharan Africa (Ferlay et al., 2013).

Liver (Male): Cum 0-74

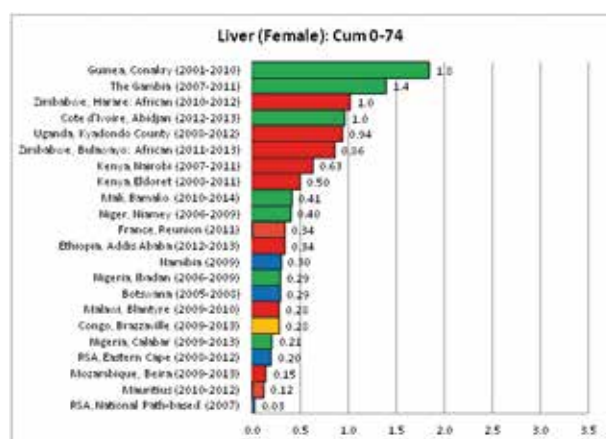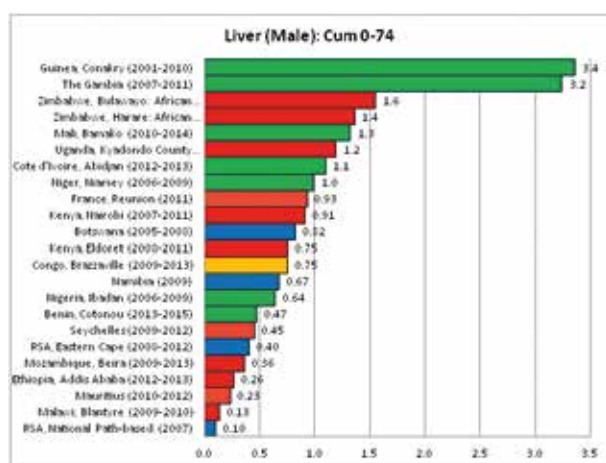
Liver (Female): Cum 0-74

Fig. 7.14. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the liver among males and females in sub-Saharan Africa, by registry population

The highest cumulative incidence rates are found in parts of western and eastern Africa, with cumulative incidence in males younger than 75 years as high as 3.4% in Guinea (Conakry) and 3.2% in The Gambia, compared with < 1% in parts of central Africa (Fig. 7.14). In general, incidence rates continue to increase with age, and they are higher in males than in females (Fig. 7.16).

Major risk factors for liver cancer in Africa vary by region. Chronic infection with hepatitis B virus (HBV) is the dominant risk factor for liver cancer in sub-Saharan Africa, accounting for the majority of cases (Kew, 1992; Kew, 2013b; Parkin, 2006). In this region, most HBV infections occur during childhood (Whittle et al., 1983),
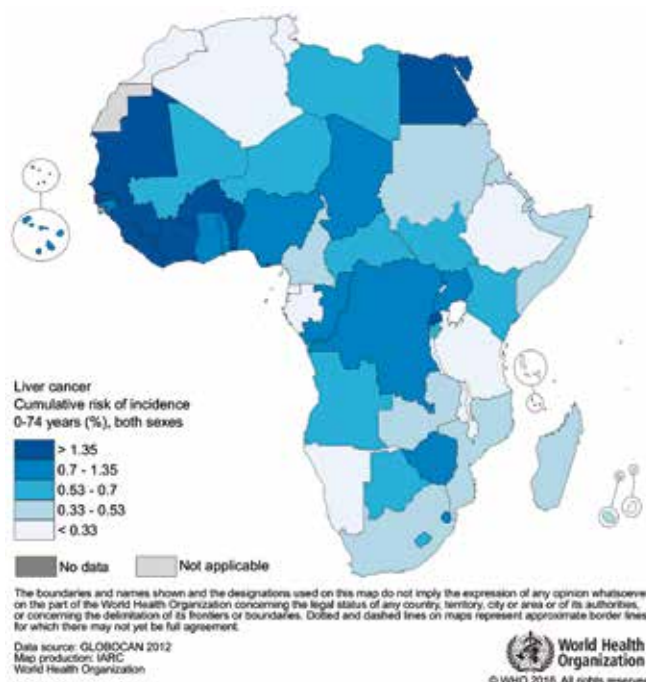

Fig. 7.15. Cumulative risk (up to and including the age of 74 years) of cancer of the liver among both sexes in Africa, expressed as a percentage, by country

in contrast to parts of Asia, where most infections occur during the perinatal period, and to economically developed countries, where most infections occur during adulthood (IARC, 2012). Western Africa and eastern Africa are the regions with the highest chronic HBV infection rates in the world; the prevalence in the general population in these two regions reaches as high as 20%. Aflatoxin (Ott et al., 2012; Schweitzer et al., 2015), a by-product of fungus, is another important risk factor for the occurrence of liver cancer in sub-Saharan Africa, and aflatoxin has a synergetic effect in the presence of chronic HBV infection (Kew, 2003; Kirk et al., 2006; Wild & Montesano, 2009). Exposure to the toxin often occurs through ingestion of contaminated staple foods, particularly maize and groundnuts (Egal et al., 2005; Kew et al., 2013a; Wild et al., 2015).

In contrast to sub-Saharan Africa, infection with hepatitis C virus (HCV) is the dominant risk factor for liver cancer in northern Africa, with a prevalence as high as 14% in Egypt (Guerra et al., 2012). The high prevalence of chronic HCV infection in Egypt is probably due to the parenteral anti-schistosomiasis therapy mass-treatment campaign that took place from the 1960s to the 1980s (Strickland, 2006). HCV infection, as well as HBV infection, can also be transmitted through contaminated blood products and unsafe sex (IARC, 2012). Other known risk factors for liver cancer include alcohol consumption, obesity, diabetes, smoking, and HIV infection (Nordenstedt et al., 2010).

A vaccine against HBV infection has been commercially available since 1982, and it has been demonstrated to reduce chronic infection in children in African settings, including in Côte d'Ivoire, The Gambia, and South Africa (Hino et al., 2001; Magoni et al., 2009; Peto et al., 2014; Viviani et al., 1999). Although evidence on the effect of the vaccine on the occurrence of liver cancer has yet to be documented in Africa, the vaccine was associated with a reduction of 80% in liver cancer incidence rates among adolescents and young adults in Taiwan, China, 30 years after the introduction of a national vaccination programme in 1984 (Chiang et al., 2013). Since 1992, WHO has recommended that the vaccine be included in routine national infant immunization programmes in endemic areas, such as sub-Saharan Africa. However, the introduction of the vaccine has been slow in this region because of its cost. According to the WHO vaccination database, as of 2014, all 48 countries in sub-Saharan Africa (except South Sudan, for which there are no data) have introduced the HBV vaccine into their national infant immunization schedules. However, the proportion of infants aged 1 year that had received three doses of the vaccine was < 80% in 19 countries and < 70% in 10 countries (WHO, 2018). Furthermore, recent studies in parts of sub-Saharan Africa found that a substantial proportion of pregnant women infected with HBV are at higher risk of transmitting the infection to their infants (Andersson et al., 2015; Chasela et al., 2014), and that chronic HBV infection is not uncommon in children who were vaccinated according to schedule during infancy (Ekra et al., 2008). These findings suggest that vaccination should start at birth (Andersson et al., 2015), which is not done in most countries because of a long-standing assumption about the rarity of mother-to-child transmission of HBV infection in the region.

Liver cancer rates in sub-Saharan Africa can also be reduced substantially through the implementation of proven post-harvest interventions that prevent aflatoxin contamination, including sorting and grain cleaning and drying (Wild et al., 2015). One such community intervention among groundnut farmers in western Africa reported significant reductions in both groundnut contamination (70%) and blood levels (Turner et al., 2005). Additional primary preventive measures for liver cancer include practising safer sex, sterilizing injection needles, and screening blood products to minimize horizontal transmission of HCV and HBV infections. Secondary preventive measures include treating patients who have chronic HBV and HCV infections and increasing awareness about the early-stage presentation and treatment of the disease. Egypt established a national network of 23 viral hepatitis facilities throughout the country in 2008 to treat patients who have chronic HBV and HCV infections at a reduced cost (Centers for Disease Control and Prevention, 2012). In The Gambia and Senegal, population-based demonstration projects to screen for chronic HBV infections and to treat positive patients with antiviral therapy (tenofovir) were launched in 2011 (Shimakawa et al., 2014).
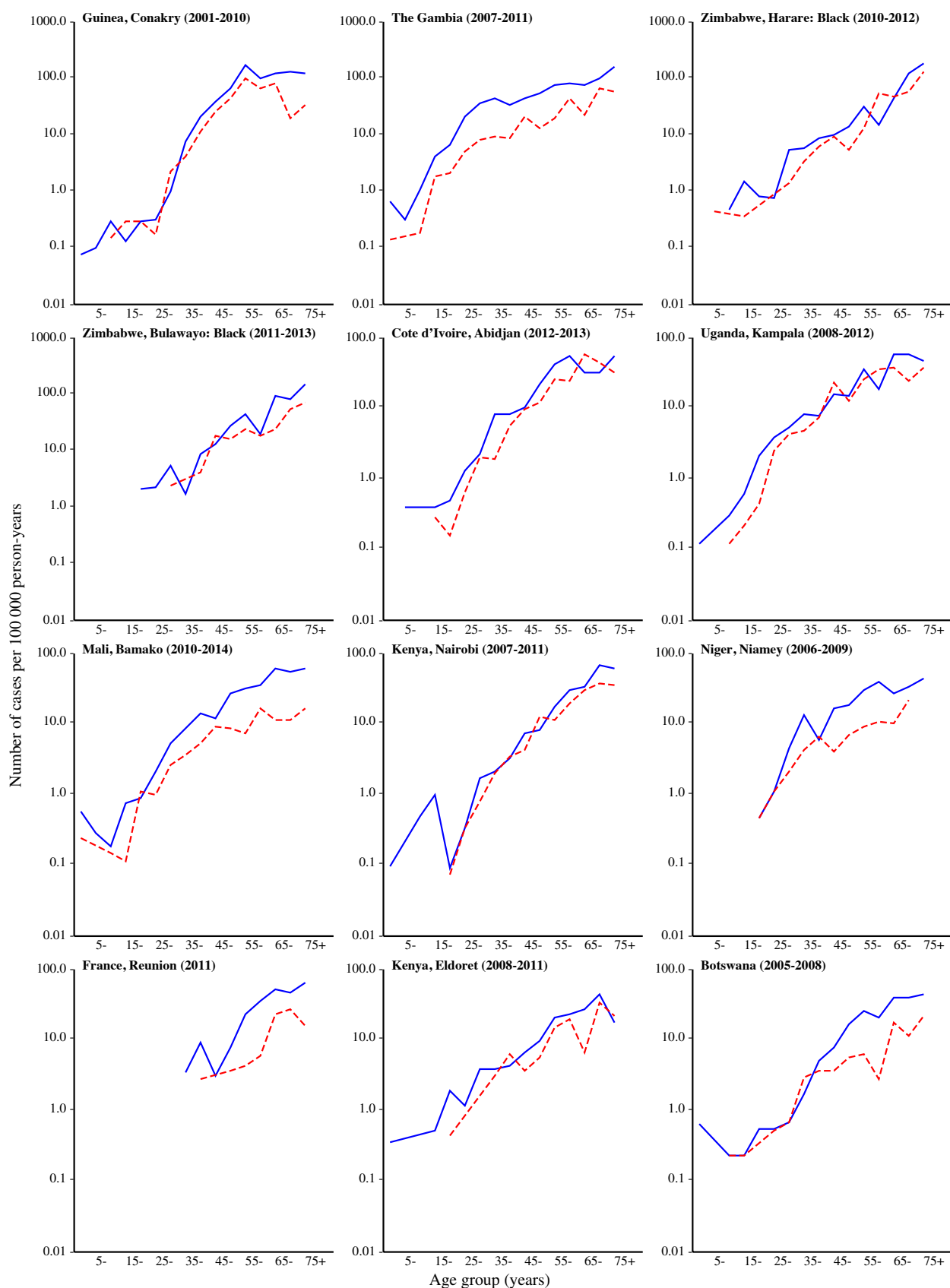
Liver (C22)

Fig. 7.16. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the liver among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
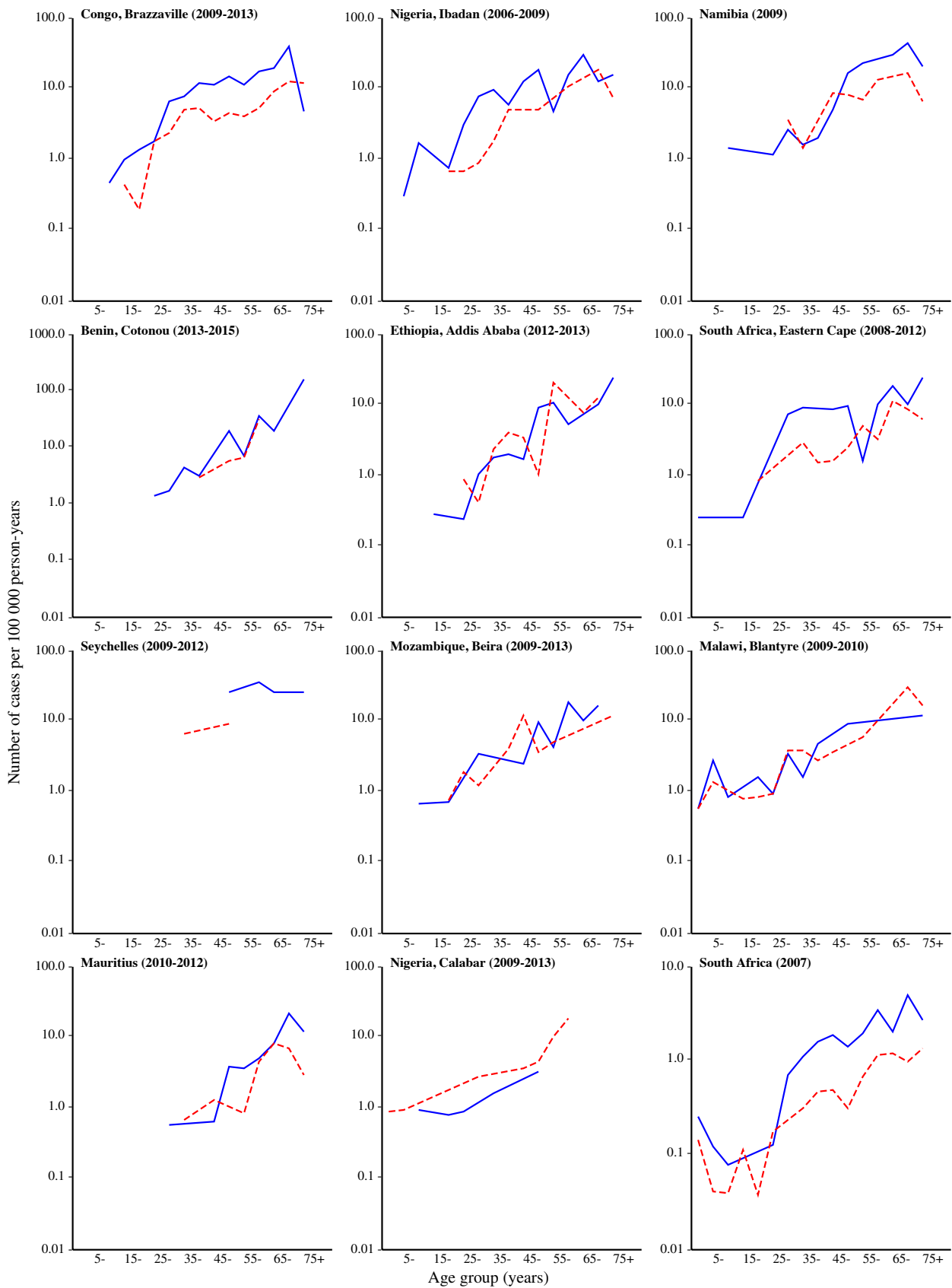
Liver (C22)

Fig. 7.16 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the liver among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Kaposi sarcoma

An estimated 37 500 cases of Kaposi sarcoma, 23 800 in males and 13 700 in females, were diagnosed in 2012 in Africa; all except about 300 of these cases were diagnosed in sub-Saharan Africa.
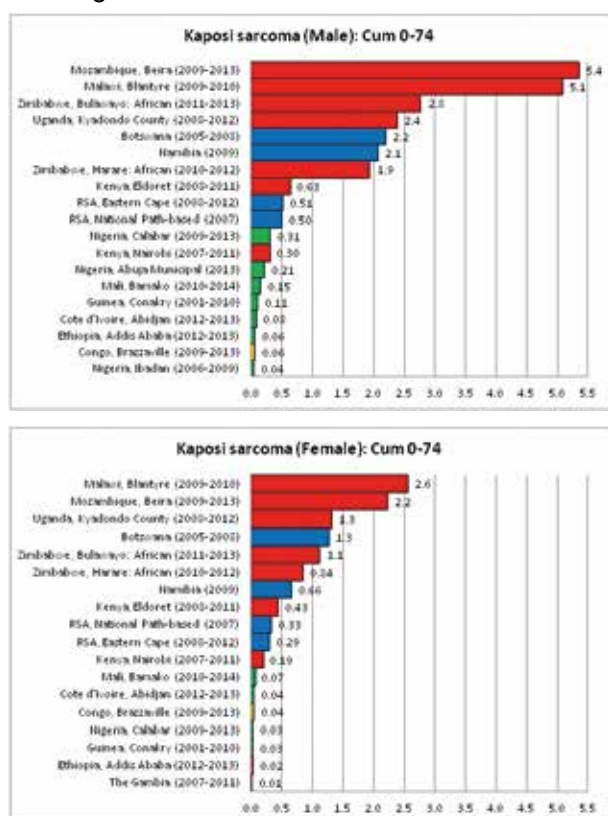

Fig. 7.17. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of Kaposi sarcoma among males and females in sub-Saharan Africa, by registry population
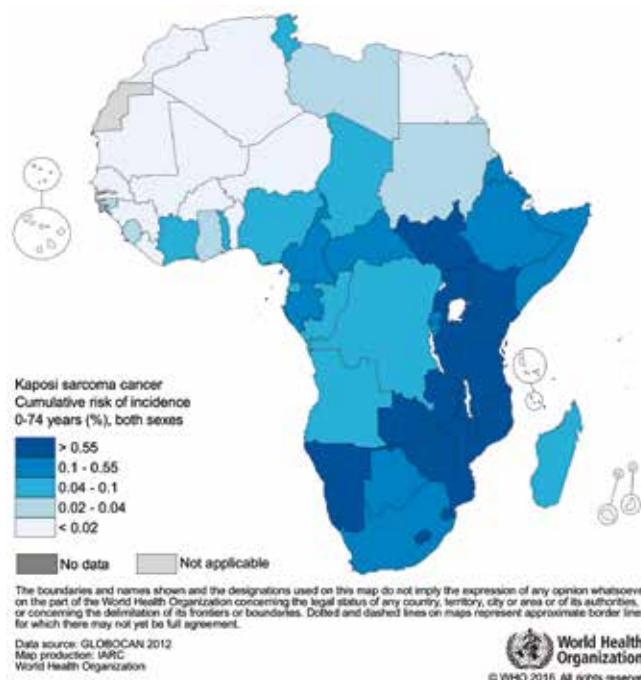

Fig. 7.18. Cumulative risk (up to and including the age of 74 years) of Kaposi sarcoma among both sexes in Africa, expressed as a percentage, by country

The bar charts (Fig. 7.17) and the GLOBOCAN 2012 map (Fig. 7.18) show that the region most affected is eastern Africa, with the highest incidence rates observed in Beira (Mozambique) and Blantyre (Malawi), followed by southern Africa, with lower rates in western Africa. This geographical pattern is consistent with the background prevalence of HIV infection in each of these regions.

Before the HIV/AIDS epidemic in Africa, the highest incidence of Kaposi sarcoma was in central Africa, with lower frequencies in northern and southern Africa (Cook-Mozaffari et al., 1998; IARC, 1996; Oettle 1962). Kaposi sarcoma-associated herpesvirus (KSHV)/ human herpesvirus-8 (HHV-8) is considered to be a necessary cause for the development of Kaposi sarcoma (IARC, 2012), although there is only a weak correlation between KSHV prevalence and the so-called endemic Kaposi sarcoma, which means that other cofactors are certainly involved (Dedicoat & Newton, 2003). Endemic Kaposi sarcoma was mainly a disease of the elderly, with its incidence increasing progressively after the age of 30–35 years. In older age groups, Kaposi sarcoma was about 10 times as common in males as in females (Hutt, 1981; Oettle, 1962).

In Europe and North America, risk of Kaposi sarcoma is increased with HIV-1-related immunosuppression by several orders of magnitude (in the thousands) (IARC, 2012). In Africa, the relative risks, although still elevated, are substantially lower than those reported in developed countries. The reasons for this are unclear but may reflect differences in background risk and competing mortality. The risk is much higher (an odds ratio of 1600) in HIV-positive individuals with high antibody titres of HHV-8 immunoglobulin G (Sitas et al., 1999).

The incidence rates of Kaposi sarcoma rose several-fold in eastern Africa and other parts of sub-Saharan Africa during the 1990s, consistent with the HIV/AIDS epidemic in these regions (Chokunonga et al., 1999; Parkin et al., 1999), and incidence rates still correlate, at least to some extent, with the prevalence of HIV/AIDS. As a result of the HIV/AIDS epidemic, the incidence of Kaposi sarcoma has also increased in countries where it was previously relatively rare but where KSHV was prevalent, such as in southern Africa. HIV-associated Kaposi sarcoma involves internal organs and lymph nodes, features that were typical of childhood Kaposi sarcoma in the pre-AIDS era. The age-specific incidence curves in those centres with high rates of HIV-related Kaposi sarcoma have also changed: epidemic Kaposi sarcoma shows a pattern reminiscent of the prevalence of HIV infection, with a modest peak in children up to the age of 4 years,

a decrease until the age of 15 years, and then a progressive increase to a peak in young adults, with younger ages in females than in males (Fig. 7.19).

Although Kaposi sarcoma continues to be a leading cause of cancer in most parts of eastern Africa, rates are declining because of the reduction in the prevalence of HIV and the wider availability of highly active antiretroviral therapy (HAART) (Chokunonga et al., 2013; Mills et al., 2011; Wabinga et al., 2014).
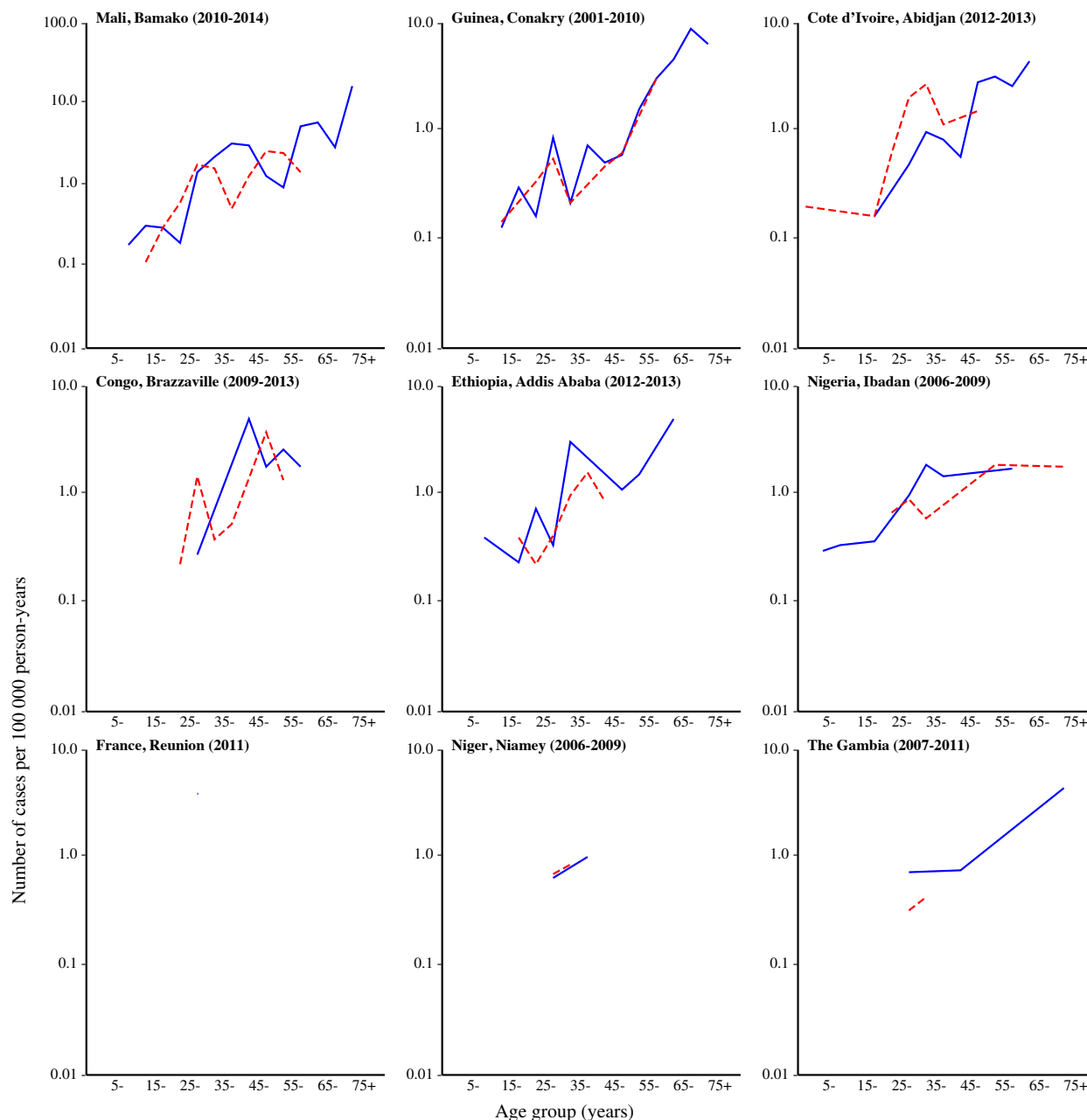
Kaposi sarcoma (C46)

Fig. 7.19. Age-specific incidence rates (expressed as cases per 100 000 person-years) of Kaposi sarcoma among males (solid blue lines) and females (dashed red lines) in 21 of the 25 registry populations of sub-Saharan Africa included in this volume
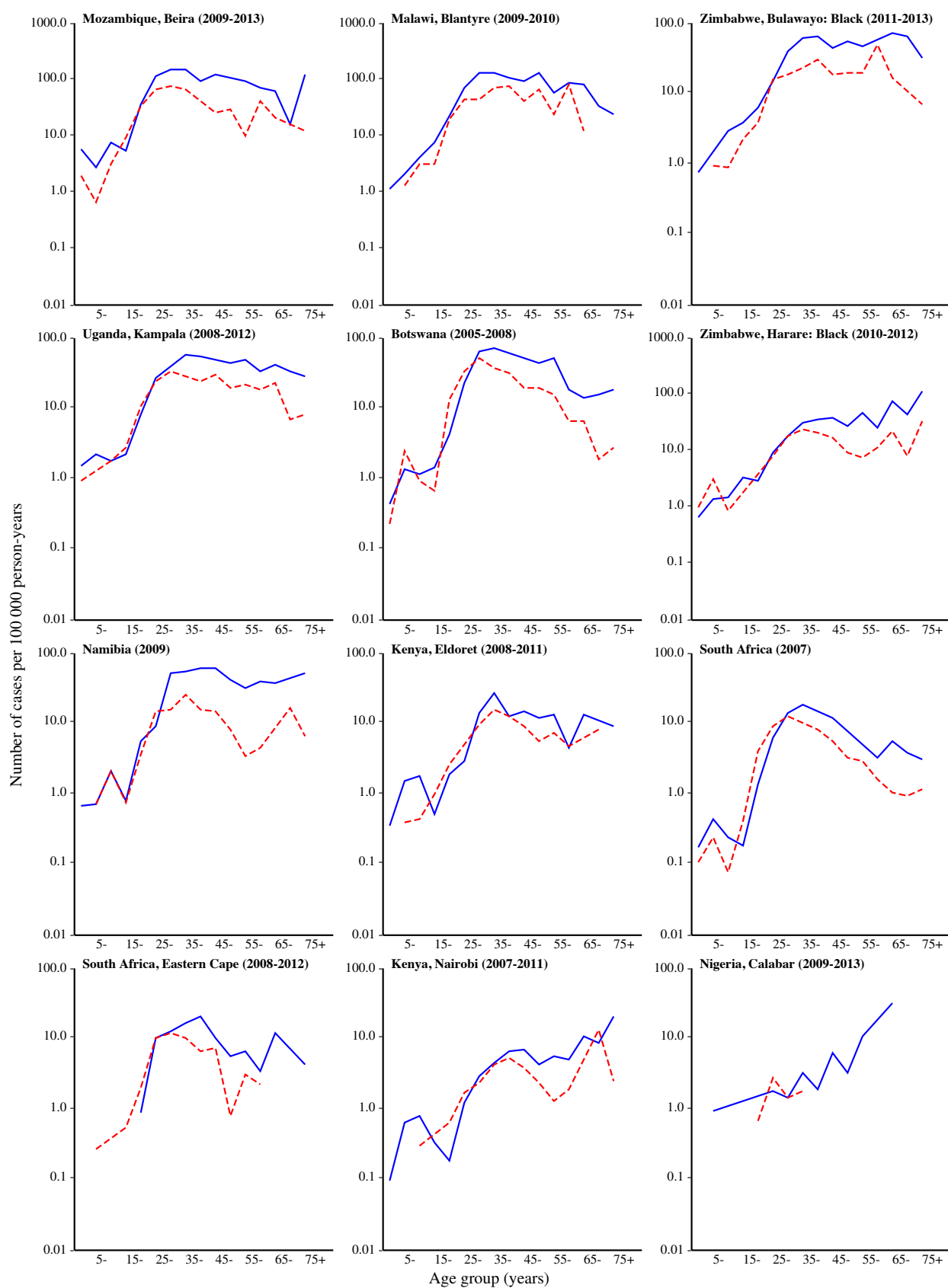
Kaposi sarcoma (C46)

Fig. 7.19 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of Kaposi sarcoma among males (solid blue lines) and females (dashed red lines) in 21 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the colorectum

Colorectal cancer is the fifth most common malignancy in Africa, with 41 000 new cases and about 29 000 deaths estimated to have occurred in 2012 (Ferlay et al., 2015). The cumulative risk of colorectal cancer by cancer registry range from < 0.2% in Conakry (Guinea) and The Gambia to > 4% in Seychelles in males, and from < 0.1% in The Gambia to almost 3% in Réunion (France) in females. In general, the risk of the disease for both sexes combined is highest in parts of northern Africa, southern Africa, and eastern Africa, and lowest in parts of western Africa (Fig. 7.21).

Colon and rectum (Male): Cum 0-74

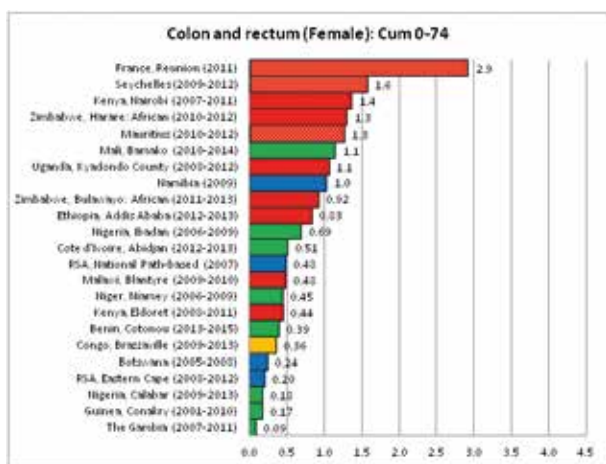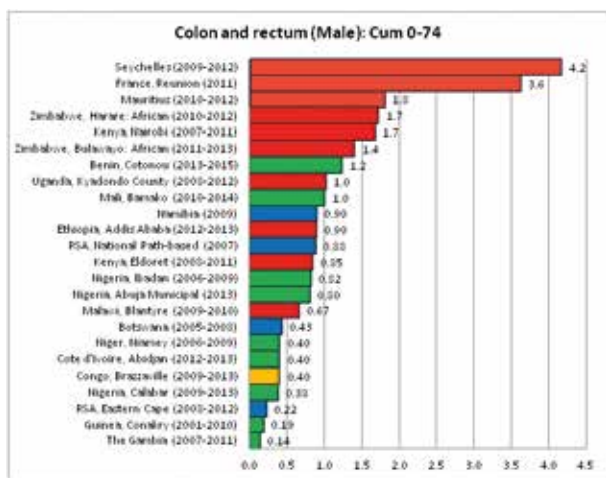**Colon and rectum (Female): Cum 0-74**

Fig. 7.20. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the colorectum among males and females in sub-Saharan Africa, by registry population

Colorectal cancer is the most frequently diagnosed cancer in men in Ethiopia, and the second most commonly diagnosed cancer (after breast cancer) in women in Algeria, Tunisia, and Libya. Incidence rates increase with age in all registries, and the rates are generally higher in males than in females (Fig. 7.22).

Previous studies documented increases in incidence rates of colorectal cancer in several African countries,
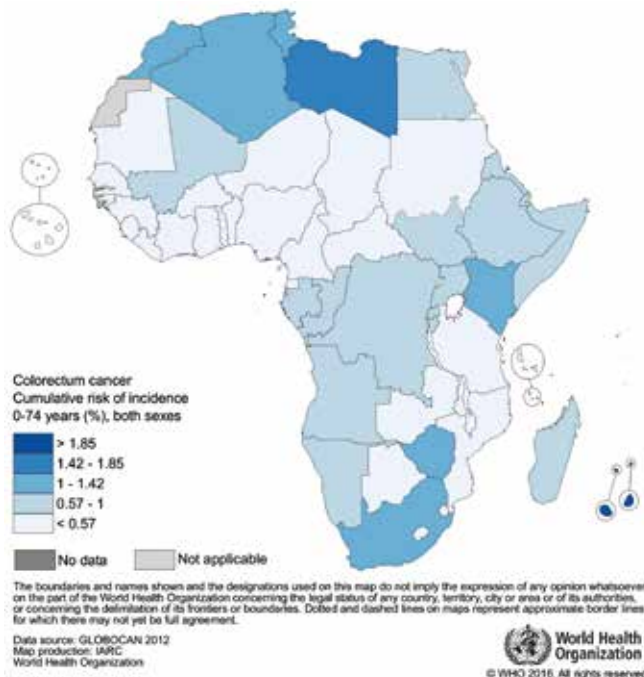

Fig. 7.21. Cumulative risk (up to and including the age of 74 years) of cancer of the colorectum among both sexes in Africa, expressed as a percentage, by country

including in Uganda (Kampala), South Africa (rural Eastern Cape), Zimbabwe (Harare, Black population), and Tunisia (Sousse region) (Chokunonga et al., 2013; Missaoui et al., 2010; Somdyala et al., 2015; Wabinga et al., 2014). For example, among the Black population of Zimbabwe, age-standardized incidence rates per 100 000 males and females increased by about 4% per year during the period 1991–2010 (Chokunonga et al., 2013). The increase in incidence in Africa is thought to reflect changes in dietary patterns from plant-based and fibre-rich food to animal-based and calorie-dense food, increases in sedentary lifestyles, and increases in the prevalence of obesity and smoking (Walker & Segal, 2002). The prevalence of obesity among women is more than one third in South Africa, Egypt, and Libya, as well as in urban areas in several countries (Kamadjeu et al., 2006; NCD Risk Factor Collaboration, 2016). However, despite the rising incidence rates in Blacks in sub-Saharan Africa and the decreasing incidence rates in Blacks in the USA (Siegel et al., 2014), rates in most parts of Africa are still less than one quarter of those in Blacks in the USA. A recent study suggested that differences in the preparation, cooking, and composition of diets between Blacks in Africa and Blacks in the USA may, in part, contribute to the marked difference in risk between those populations (O'Keefe et al., 2015).

The burden of colorectal cancer in Africa, as well as in other parts of the world, could be reduced substantially by promoting behaviours such as maintaining a healthy body weight, staying physically active, consuming a healthy (plant-based) diet, and avoiding

smoking. Colorectal cancer can also be prevented by use of screening, especially colonoscopy, which enables the detection and removal of premalignant lesions (adenomatous polyps) (Shaukat et al., 2013; Zauber et al., 2012). However, the relatively low risk of colorectal cancer and the currently inadequate health care infrastructure in most parts of Africa preclude the introduction of an organized colorectal cancer screening programme (Lambert et al., 2009).

Colorectum (C18-20)

Fig. 7.22. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the colorectum among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Colorectum (C18-20)

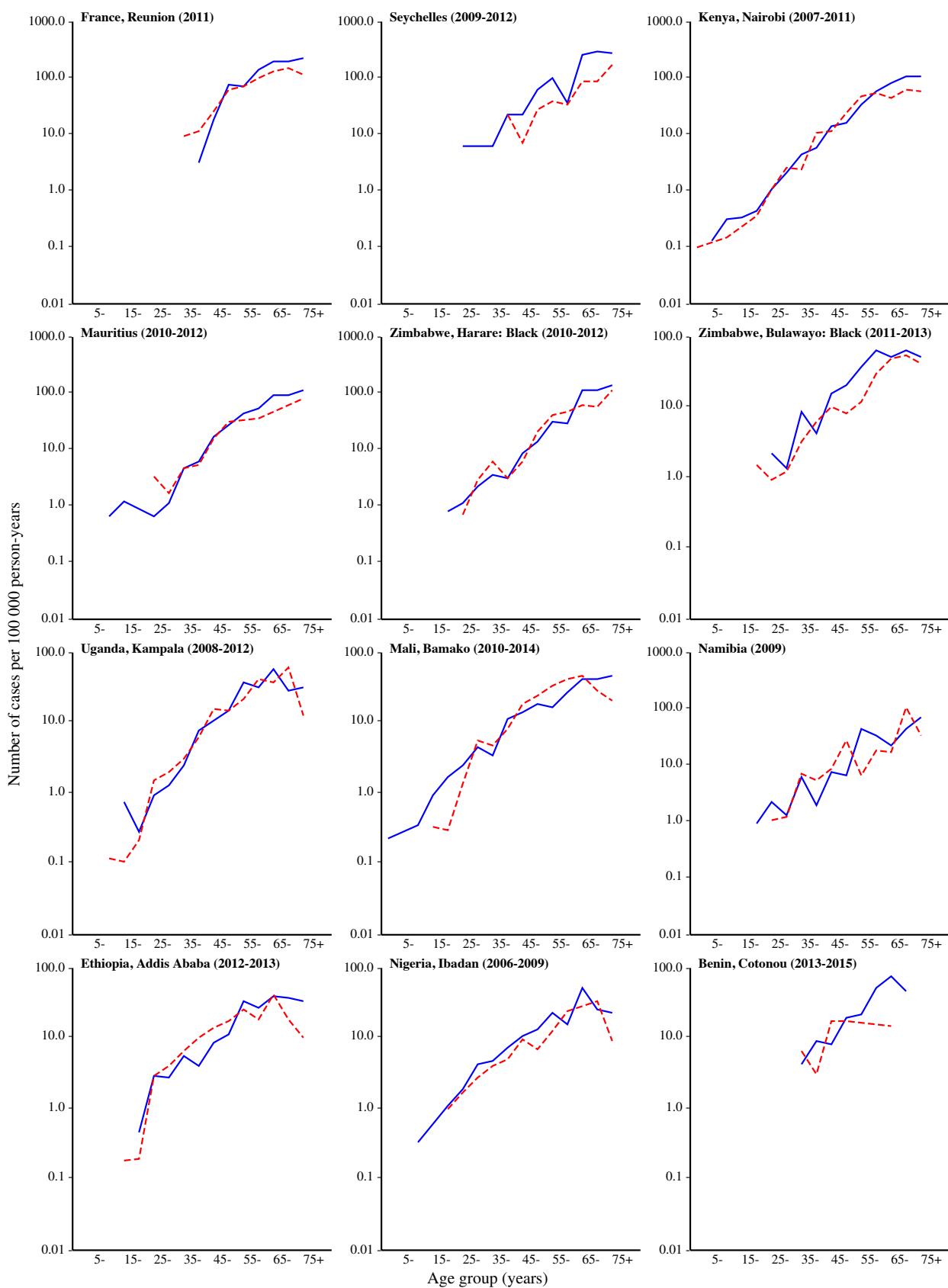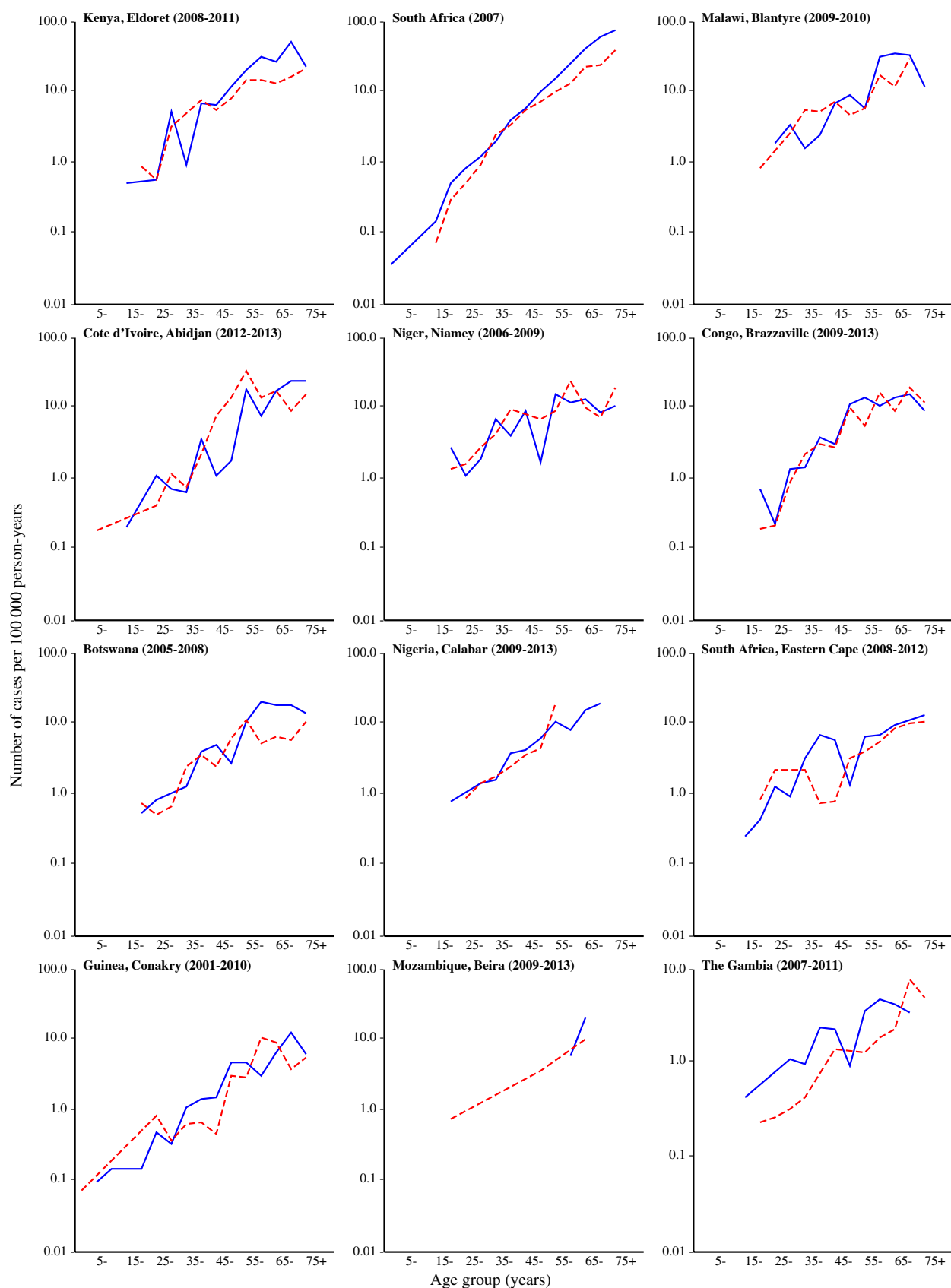Fig. 7.22 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the colorectum among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Non-Hodgkin lymphoma

An estimated 36 700 new cases and 26 400 deaths from non-Hodgkin lymphoma (NHL) occurred in 2012 in Africa. Incidence rates in both sexes in sub-Saharan Africa are lower (cumulative risk, 0.37%) than the world average (common risk, 0.54%). NHL encompasses a variety of histologically distinct forms. The summary tables (see Chapter 6) provide results (as number of cases, age-standardized incidence rate, and cumulative incidence rate) for Burkitt lymphoma in children and NHL in adults. The results for NHL in adults (i.e. older than 15 years) are summarized in Fig. 7.23.

Fig. 7.24. Cumulative risk (for ages 15–74 years) of non-Hodgkin lymphoma among both sexes in Africa, expressed as a percentage, by country
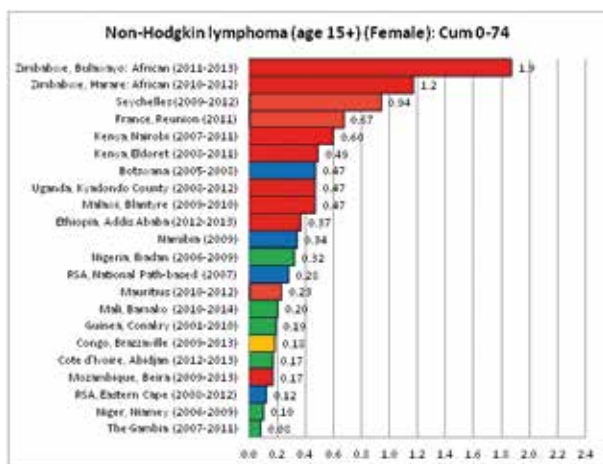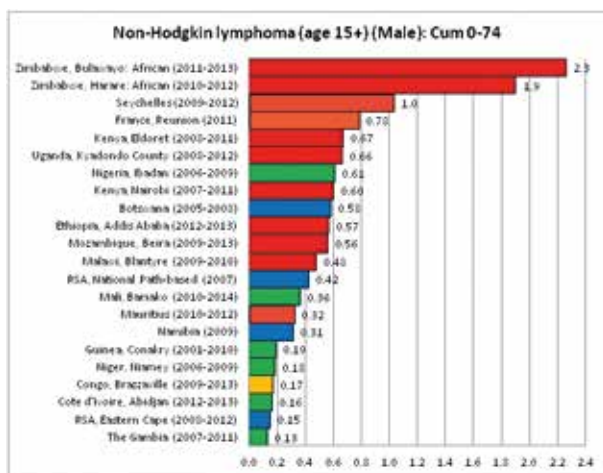

Fig. 7.23. Cumulative incidence rates for ages 15–74 years (expressed as percentages) of non-Hodgkin lymphoma among males and females in sub-Saharan Africa, by registry population

In adults, the highest incidence rates are observed in eastern Africa (Fig. 7.24). Most NHLs in Africa are of the B-cell type, and clinical series show an excess of high-grade lymphomas and a deficit of nodular lymphomas.

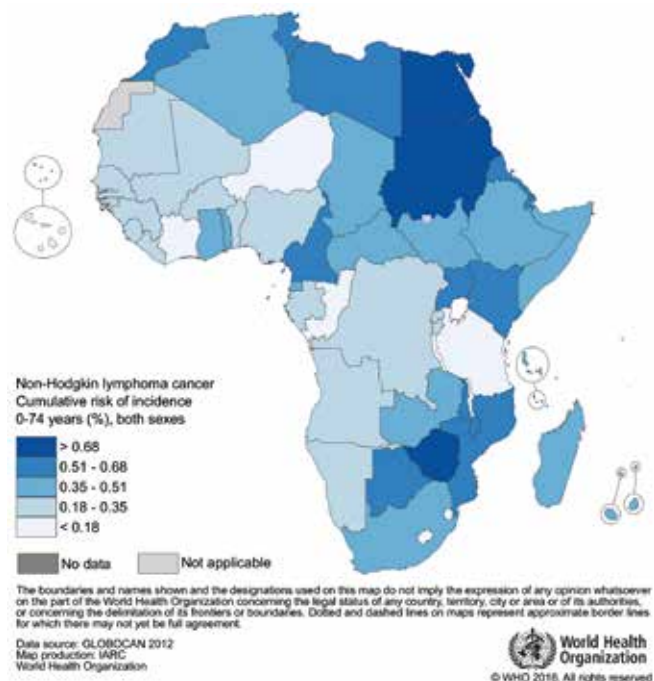Burkitt lymphoma is a very common cancer in children in parts of tropical Africa, where it may account for up to three quarters of all childhood cancers. In many of the graphs of age-specific incidence rates (Fig. 7.25), a peak of incidence can be seen in the age group 5–9 years (higher in boys than in girls), representing cases of Burkitt lymphoma. High incidence rates are seen in Blantyre (Malawi) and Kampala (Uganda), with slightly lower rates in western Africa: Abidjan (Côte d'Ivoire) and Ibadan (Nigeria). In these zones of high incidence of childhood Burkitt lymphoma, almost all cases are associated with Epstein–Barr virus (EBV) infection, as demonstrated by the presence of either EBV nuclear antigen or EBV DNA in the tumour cells. Intense, holoendemic malaria infection is a cofactor: children with Burkitt lymphoma have evidence of more frequent or intense infection with malaria compared with control children (Molyneux et al., 2012).

Little is known about the causes of NHL. Human T-cell lymphotropic viruses (e.g. HTLV-I) are common in tropical Africa (IARC, 1996) and are a cause of T-cell lymphomas, but the incidence of these cancers in Africa is low. Although EBV DNA is present in a small proportion of lymphomas, its role in causing NHL in people who are not immunosuppressed is unclear (IARC, 2012). Infection with hepatitis C virus (HCV) is considered to be a cause of B-cell NHL (IARC, 2012), and this accounts for the high incidence of NHL in Egypt, where the prevalence of HCV infection is high (Alter, 2007).

The risk of NHL in adults is increased by HIV infection, although the relative risk in HIV-positive

people in Africa is lower than in Europe and North America. The association between endemic Burkitt lymphoma and HIV is even less clear (Mbulaiteye et al., 2011). It was estimated that in 2002 about one quarter of NHL cases in sub-Saharan Africa were associated with AIDS (Parkin, 2006). However, it is not clear that the incidence of NHL in areas where there is a high prevalence of HIV infection has been much affected by increasing use of antiretroviral therapy. For example, in the Western Cape of South Africa, cases of HIV-related lymphoma accounted for 37% of all lymphomas seen in 2009 (an increase from 5% in 2002), and Burkitt lymphoma is now the most common HIV-related lymphoma, followed by diffuse large B-cell lymphoma subtypes (Abayomi et al., 2011). In Harare (Zimbabwe), incidence rates of NHL have increased steadily since 1991 (by 6.7–6.9% per year), although rates in young adults (aged 15–39 years) have decreased since 2001

(Chokunonga et al., 2016). The rate of increase in Kampala (Uganda) in 1991–2010 was similar (5.2% per year in men, 6.9% per year in women), although there was a small decrease in rates in young adults (aged 15–49 years) since 2007–2008 (Wabinga et al., 2014). It is not clear why antiretroviral therapy appears to have been less successful in reducing the incidence of NHL compared with that of Kaposi sarcoma, although, as noted, the risk associated with HIV infection is much lower for NHL than for Kaposi sarcoma. Poor coverage, late initiation of antiretroviral therapy, and incomplete viral suppression may mask any effect at the population level.

There has not been much change in the incidence of Burkitt lymphoma in either Harare or Kampala, although a recent decline in incidence has been reported in the northern United Republic of Tanzania (Aka et al., 2012).

Non-Hodgkin lymphoma (C82-85, C96)

Fig. 7.25. Age-specific incidence rates (expressed as cases per 100 000 person-years) of non-Hodgkin lymphoma among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Non-Hodgkin lymphoma (C82-85, C96)

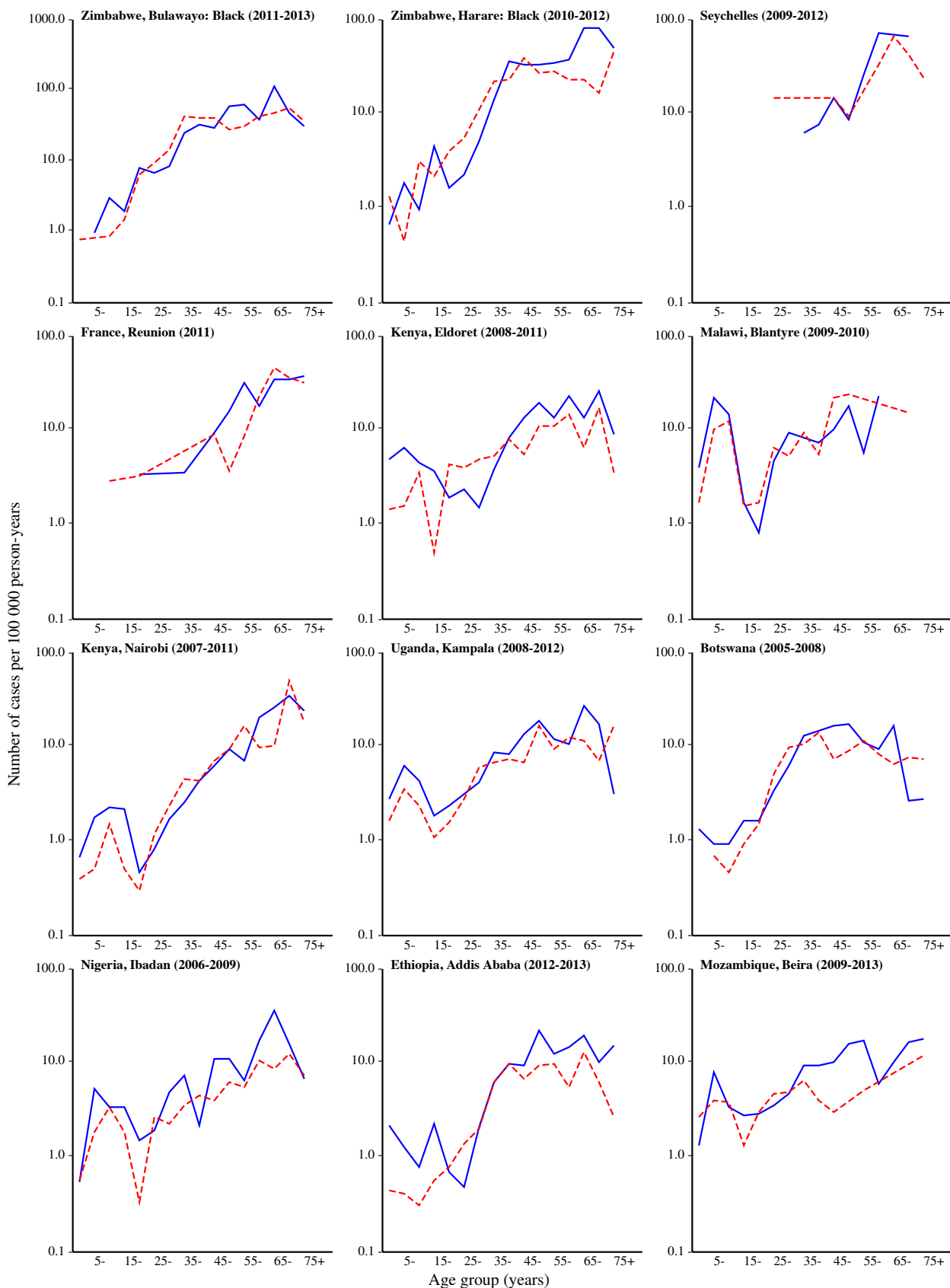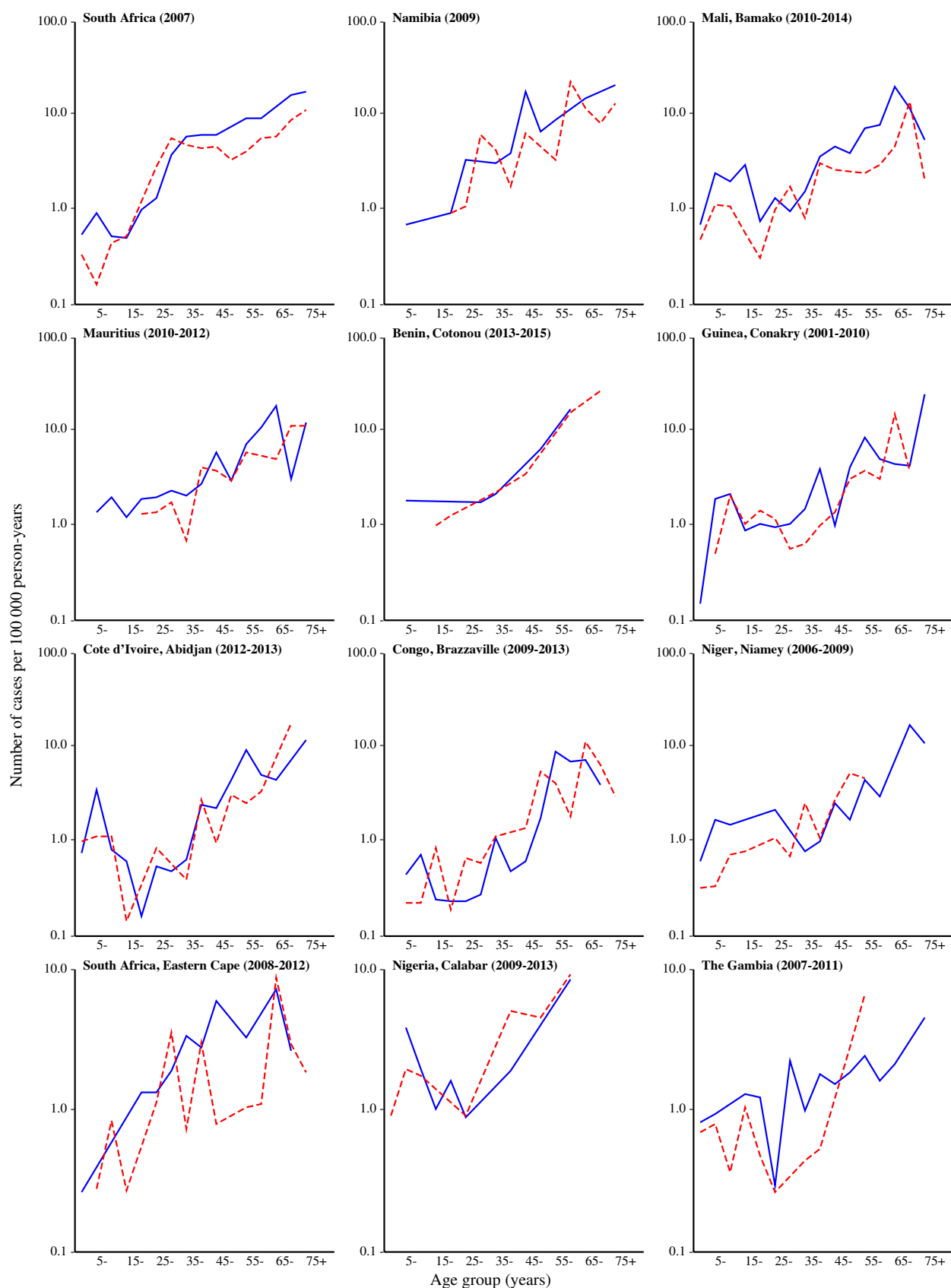**Fig. 7.25 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of non-Hodgkin lymphoma among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume**

Cancer of the oesophagus

About 27 500 new cases and 25 200 deaths from oesophageal cancer were estimated to have occurred in 2012 in Africa, and about 90% of these cases and deaths occurred in sub-Saharan Africa. Incidence rates vary substantially across the region. Cumulative incidence rates up to and including the age of 74 years range from < 0.1% in several northern and western African countries to > 2.5% in many eastern and southern African countries (Fig. 7.27). Several eastern and southern African countries are among the countries with the highest incidence rates of oesophageal cancer in the world (Arnold et al., 2015; Cheng et al., 2015).

Fig. 7.27. Cumulative risk (up to and including the age of 74 years) of cancer of the oesophagus among both sexes in Africa, expressed as a percentage, by country
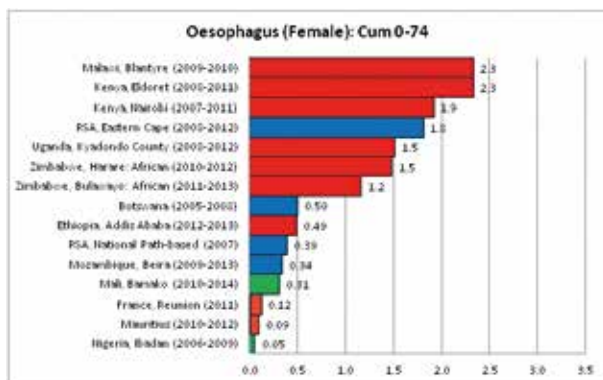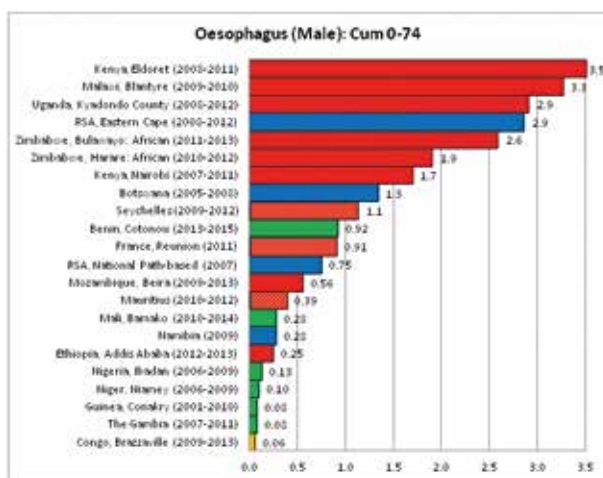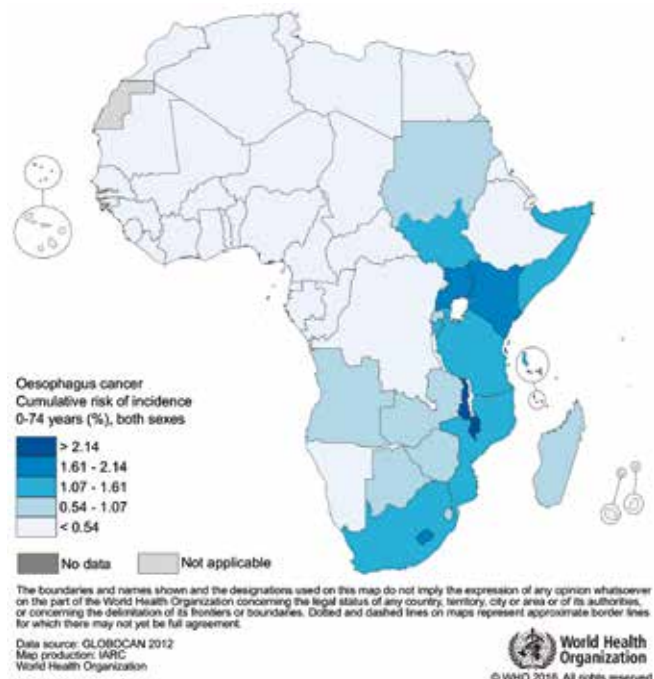
Fig. 7.26. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the oesophagus among males and females in sub-Saharan Africa, by registry population

Incidence rates increase with age. Rates are generally higher in men than in women, with a rate ratio of about 2. There are two major histological types of oesophageal cancer: squamous cell carcinoma (SCC) and adenocarcinoma. SCC is the dominant form of the disease in Africa, representing up to 90% of all cases (Cheng et al., 2015; Wabinga et al., 2004; White et al., 2002). Smoking and alcohol consumption are the two known risk factors for oesophageal cancer in high-incidence areas of southern Africa

and eastern Africa (Kayamba et al., 2015; Pacella-Norman et al., 2002; Sewram et al., 2014). A recent study cited the consumption of fermented milk with a high concentration of alcohol and acetaldehyde as a risk factor in the high incidence of oesophageal cancer in western Kenya (Nieminen et al., 2013). Nevertheless, the prevalences of both smoking and alcohol consumption are too low to account for the exceptionally high incidence rates in these regions. Worldwide, sub-Saharan Africa is the region with the lowest per capita cigarette consumption, with very little increase observed over the past 30 years (Eriksen et al., 2015). Similar patterns of exceptionally high incidence rates of oesophageal cancer with low prevalences of smoking and alcohol consumption in both men and women have been reported in parts of the Islamic Republic of Iran, China, and South America (Blot et al., 2006).

Other risk factors that are thought to contribute to the high incidence rates of oesophageal cancer in parts of eastern and southern Africa include low consumption of fruit and vegetables (Sewram et al., 2014), deficiency of certain micronutrients (Schaafsma et al., 2015), maize as a staple food (Pink et al., 2011; Sammon & Iputo, 2006), contamination of maize with fumonisins (Marasas, 2001), domestic smoke exposure from cooking with charcoal or firewood (Kayamba et al., 2015; Pacella-Norman R et al., 2002), and human papillomavirus (HPV) infection (Petrick et al., 2014).

Among recent studies that examined temporal trends in oesophageal cancer incidence rates in

high-risk areas of eastern and southern Africa, one study reported a decline (Somdyala et al., 2015), whereas others reported no change (Chokunonga et al., 2016; Parkin et al., 2010). The burden of oesophageal cancer in these high-risk areas could be mitigated by promoting smoking cessation and improving dietary patterns (Walker et al., 2002). However, to substantially reduce the risk of the disease, the elucidation of major risk factors is required.

Oesophagus (C15)

Fig. 7.28. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the oesophagus among males (solid blue lines) and females (dashed red lines) in 23 of the 25 registry populations of sub-Saharan Africa included in this volume

Oesophagus (C15)

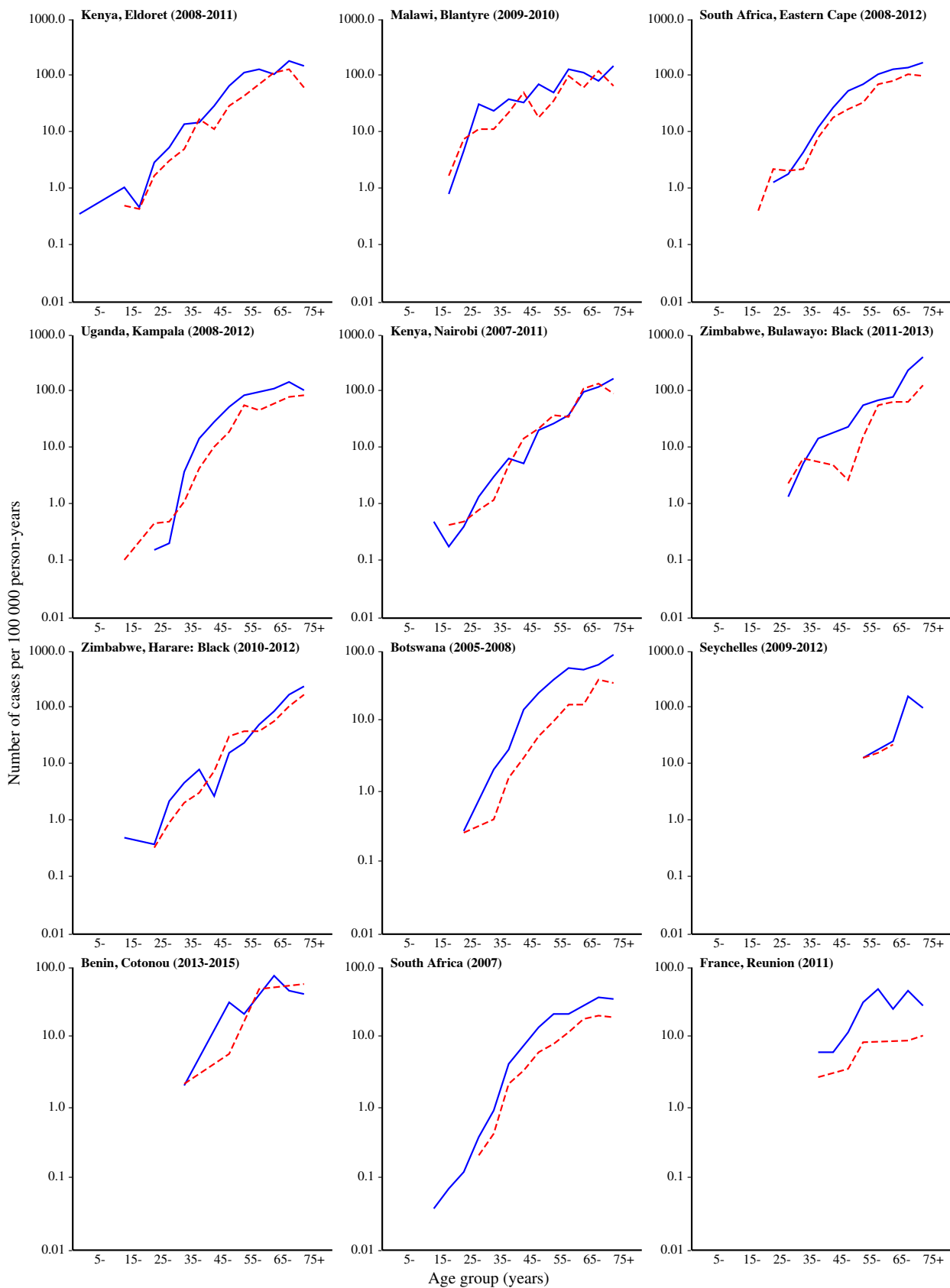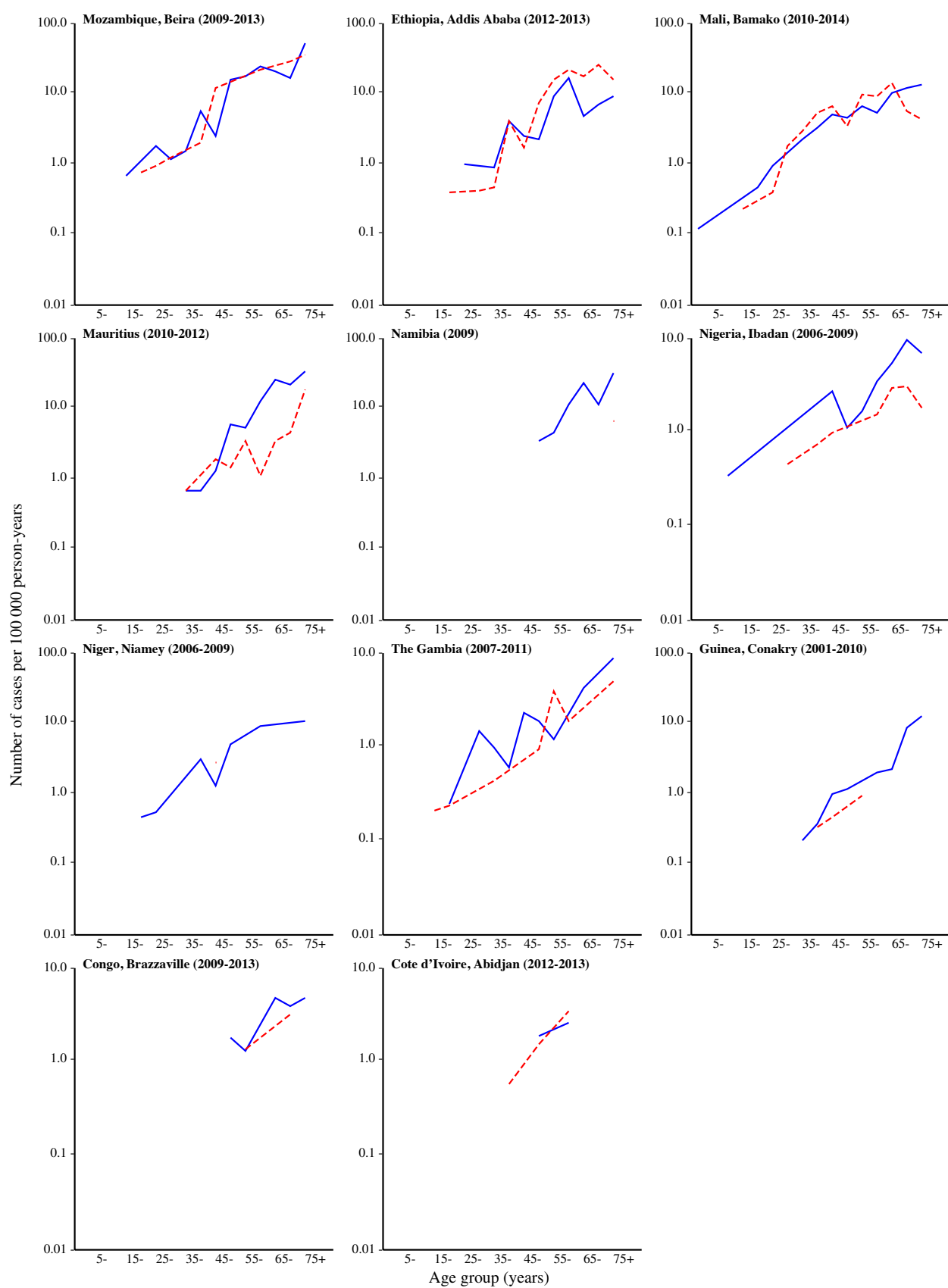**Fig. 7.28 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the oesophagus among males (solid blue lines) and females (dashed red lines) in 23 of the 25 registry populations of sub-Saharan Africa included in this volume**

Cancer of the stomach

About 24 000 new cases of stomach cancer and 22 000 deaths from stomach cancer were estimated to have occurred in 2012 in Africa, with three quarters (18 000 new cases) occurring in sub-Saharan Africa. Stomach cancer is slightly more common in males than in females (sex ratio, 1.2). Incidence rates are relatively low by world standards: the cumulative incidence rate up to and including the age of 74 years is 0.46% in sub-Saharan Africa (very similar to that in the USA), compared with 1.39% globally.

Stomach (Male): Cum 0–74

Registry	Value
Zimbabwe, Harare: African (2010-2012)	2.4
Mali, Bamako (2010-2014)	2.3
France, Reunion (2011)	2.1
Benin, Cotonou (2013-2015)	1.5
Kenya, Nairobi (2007-2011)	1.2
Kenya, Eldoret (2005-2011)	0.96
Uganda, Kyandondo County (2008-2012)	0.85
Mauritius (2010-2012)	0.59
Guinea, Conakry (2001-2010)	0.56
Zimbabwe, Bulawayo: African (2011-2013)	0.51
Namibia (2009)	0.46
Seychelles (2009-2012)	0.44
RSA, National Path-based (2007)	0.44
Malawi, Blantyre (2009-2010)	0.39
Cote d'Ivoire, Abidjan (2012-2013)	0.37
Ethiopia, Addis Ababa (2012-2013)	0.32
Nigeria, Ibadan (2006-2009)	0.28
The Gambia (2007-2011)	0.24
Niger, Niamey (2006-2009)	0.22
Congo, Brazzaville (2009-2013)	0.15
RSA, Eastern Cape (2008-2012)	0.13
Botswana (2005-2008)	0.07
Nigeria, Calabar (2009-2013)	

Stomach (Female): Cum 0–74

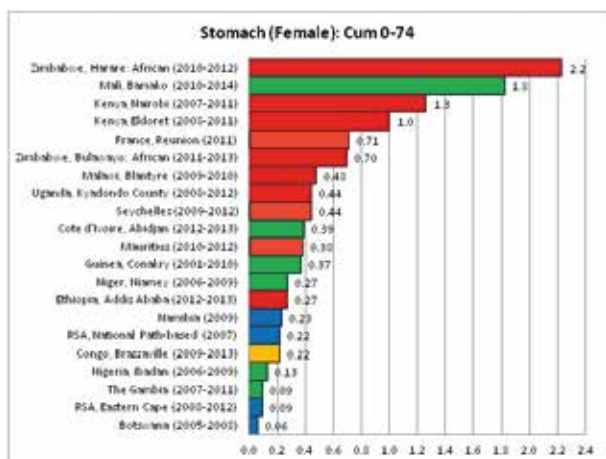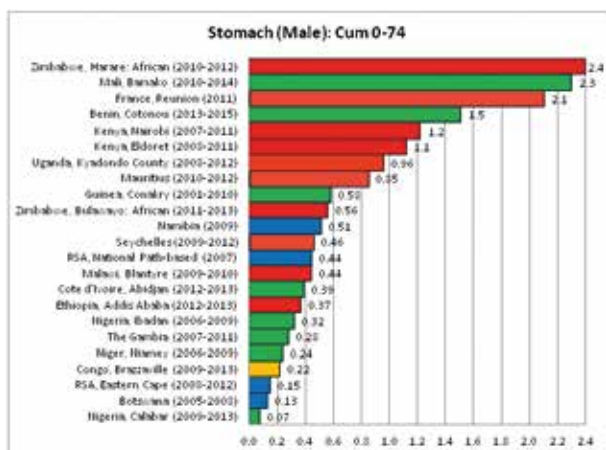| Registry	Value
Zimbabwe, Harare: African (2010-2012)	2.2
Mali, Bamako (2010-2014)	1.8
Kenya, Nairobi (2007-2011)	1.3
Kenya, Eldoret (2005-2011)	1.0
France, Reunion (2011)	0.71
Zimbabwe, Bulawayo: African (2011-2013)	0.70
Malawi, Blantyre (2009-2010)	0.48
Uganda, Kyandondo County (2008-2012)	0.44
Seychelles (2009-2012)	0.44
Cote d'Ivoire, Abidjan (2012-2013)	0.39
Mauritius (2010-2012)	0.30
Guinea, Conakry (2001-2010)	0.37
Niger, Niamey (2006-2009)	0.27
Ethiopia, Addis Ababa (2012-2013)	0.27
Namibia (2009)	0.23
RSA, National Path-based (2007)	0.22
Congo, Brazzaville (2009-2013)	0.22
Nigeria, Ibadan (2006-2009)	0.13
The Gambia (2007-2011)	0.09
RSA, Eastern Cape (2008-2012)	0.09
Botswana (2005-2008)	0.06

Fig. 7.29. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the stomach among males and females in sub-Saharan Africa, by registry population

The centres with the highest recorded cumulative incidence rates are Harare (Zimbabwe), Bamako (Mali), Kenya, and Réunion (France) (Fig. 7.29). This scattered occurrence is reflected in the GLOBOCAN 2012 estimates (Fig. 7.30). It seems probable that gastric cancer is somewhat underdiagnosed, or is confused with cancers of the oesophagus, when endoscopy services are not well developed; a significant proportion

Stomach cancer
Cumulative risk of incidence
0–74 years (%), both sexes

- > 1.01
- 0.78 – 1.01
- 0.56 – 0.78
- 0.33 – 0.56
- < 0.33
- No data
- Not applicable

Data source: GLOBOCAN 2012
Map production: IARC
World Health Organization

World Health Organization
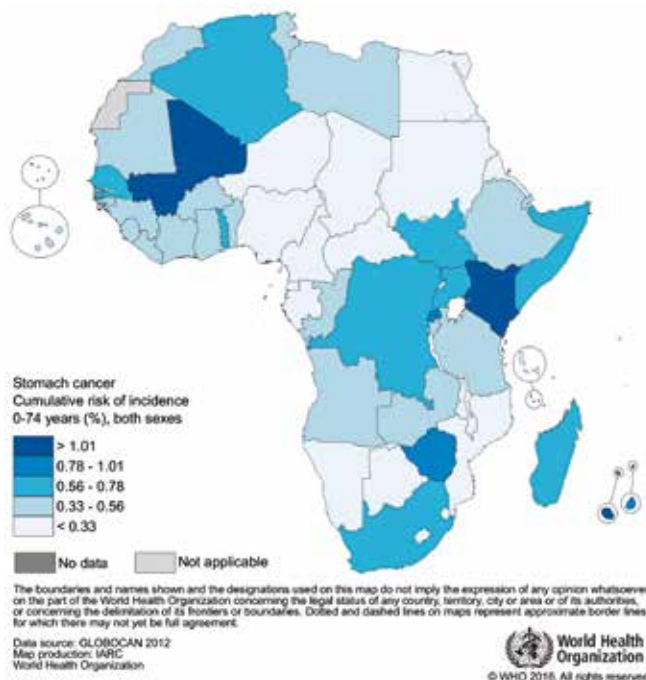© WHO 2018. All rights reserved

Fig. 7.30. Cumulative risk (up to and including the age of 74 years) of cancer of the stomach among both sexes in Africa, expressed as a percentage, by country

of cases in several centres are diagnosed without histology. In rural Kenya, the reported incidence of stomach cancer increased when the region's main hospital acquired an endoscope (McFarlane et al., 2001).

The relatively high rates in Mali have been previously noted (Bayo et al., 1990). Historical data also suggest an area of relatively high risk in the Great Lakes region. A relatively high frequency of stomach cancers has been recorded in Rwanda (Newton et al., 1996). In western Uganda, stomach cancer was reported to be the second most common cancer, accounting for 12% of all cancers in males and 6% of all cancers in females (Parkin et al., 2003).

The dramatic decline in the incidence of gastric cancer in high-income countries is a well-known phenomenon (Howson et al., 1986), which is linked to improvements in food preservation and a decline in transmission of and infection by *Helicobacter pylori*. However, there is no indication that the incidence of stomach cancer is declining in Africa; time trends for the cancer registries in Kampala (Uganda) (Wabinga et al., 2014), Harare (Zimbabwe) (Chokunonga et al., 2013), and Bamako (Mali) (this volume) indicate little or no change in incidence during the past 20 years. No decline was noted in rates of histologically diagnosed cases in South Africa between 1986 and 1995 (Sitas et al., 1998).

H. pylori infection is now recognized as the most important risk factor for non-cardia gastric cancers (IARC, 2012). The fact that the prevalence of infection

with *H. pylori* appears to be high in African populations (IARC, 1994) but that, in many areas, the incidence of gastric cancer is low has been referred to as "an enigma" (Holcombe, 1992). However, the pathway from infection to cancer is indirect, involving chronic inflammation, resulting in progressively severe and then chronic atrophic gastritis and, ultimately, intestinal metaplasia. This process is modulated by host-determined inflammatory responses and specific *H. pylori* virulence factors, including cytotoxin-associated gene A (CagA). *H. pylori* CagA-positive strains are the predominant strains in Africa (Mitchell et al., 2002), but there is much genetic variation within CagA-positive *H. pylori*, with different carcinogenic potential (Kidd et al., 1999; Yamaoka et al., 2008). In addition to the large differences in the carcinogenic potential of generic variants of *H. pylori*, other factors are involved in modulating risk, including diets low in intake of fruit, vegetables, and vitamin C and/or high in intake of salts, and tobacco smoking. There has been almost no research in Africa in this area; although there are many places where food is salted or pickled to aid preservation, the relative importance of these risk factors in local settings is unknown.
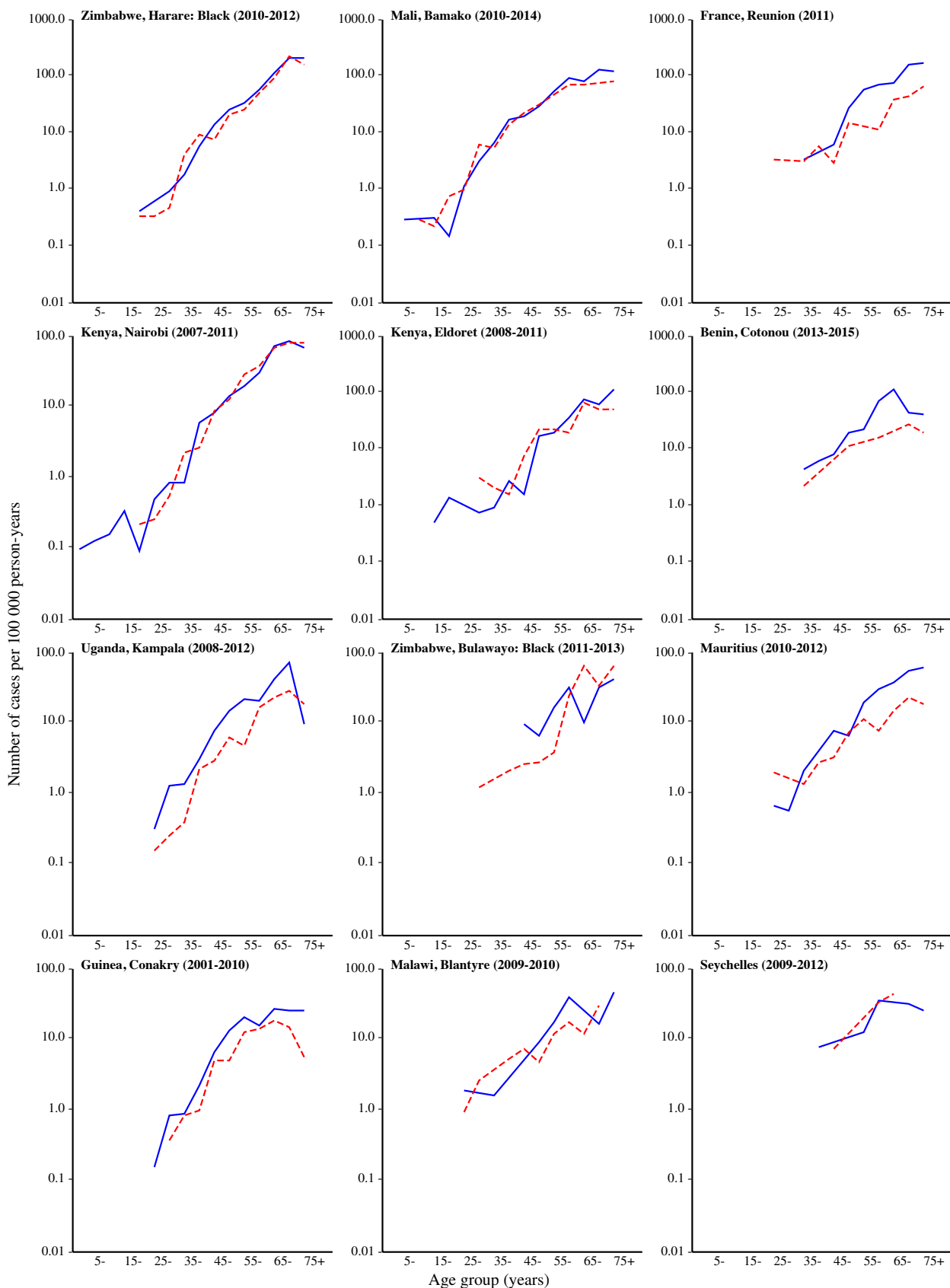
Stomach (C16)

Fig. 7.31. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the stomach among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
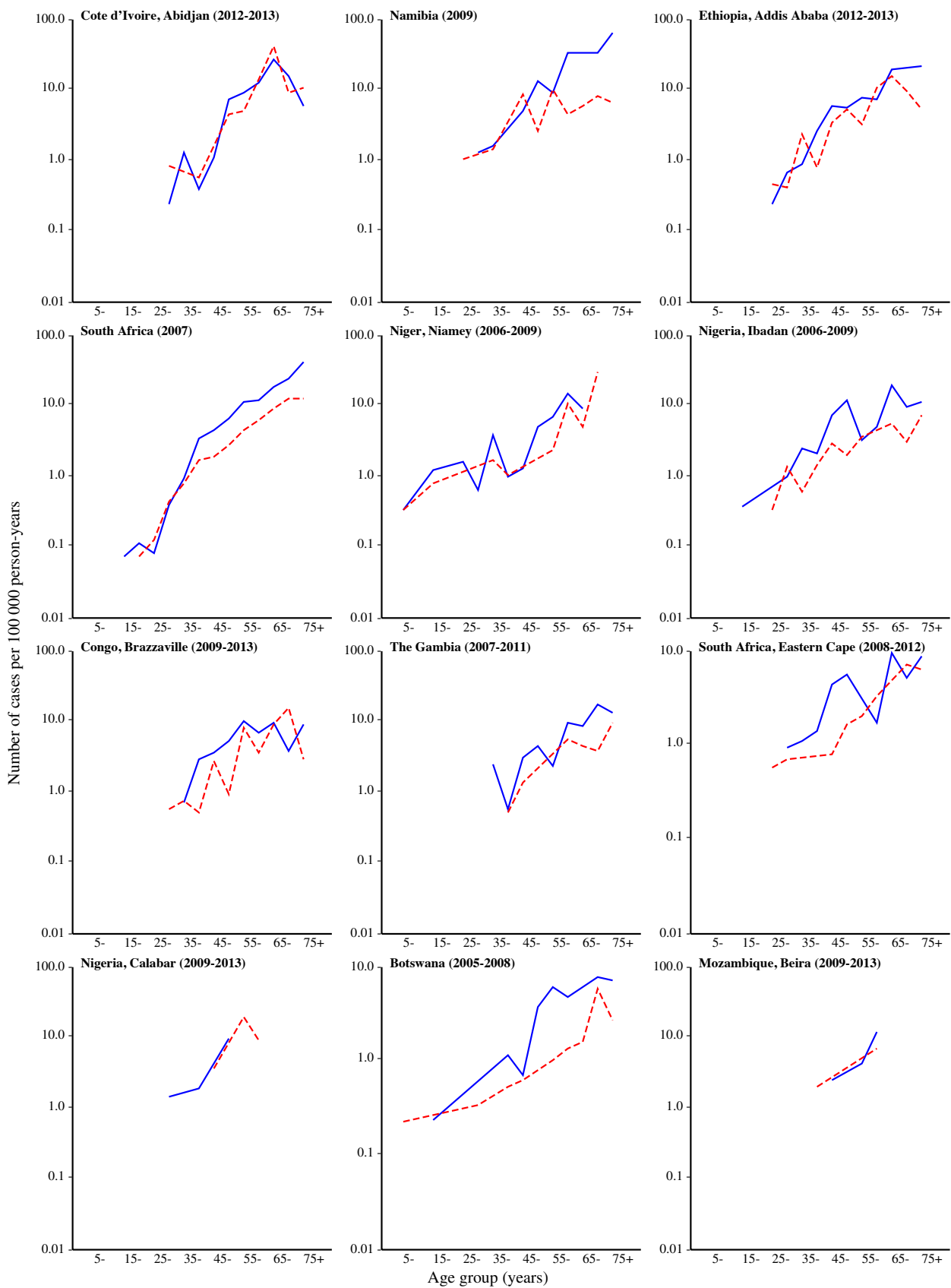
Stomach (C16)

Fig. 7.31 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the stomach among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the trachea, bronchus, and lung

About 30 300 new lung cancer cases and 27 000 deaths from lung cancer were estimated to have occurred in 2012 in Africa, with men accounting for > 70% of the total cases and deaths (Ferlay et al., 2015).
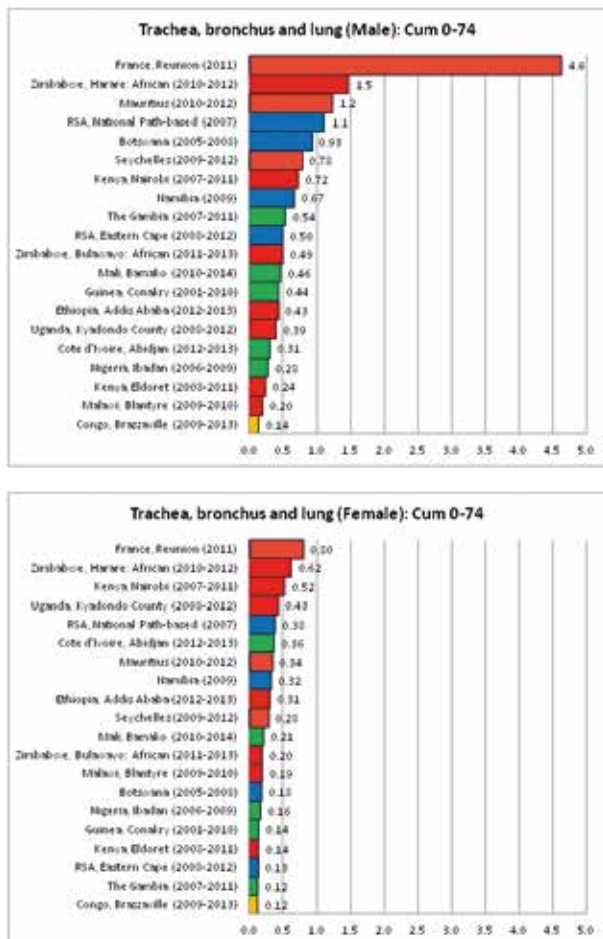

Fig. 7.32. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the trachea, bronchus, and lung among males and females in sub-Saharan Africa, by registry population

The risk of lung cancer varies substantially across countries (registries), with cumulative risk (up to and including the age of 74 years) ranging from < 0.2% in Brazzaville (Congo) to > 4.5% in Réunion (France) in males, and from < 0.2% in Brazzaville (Congo) to 0.80% in Réunion (France) in females. In general, the highest incidence rates are found in parts of northern Africa (Libya, Tunisia, and Morocco), South Africa, and the Indian Ocean island populations (Mauritius, Réunion, and Seychelles) (Fig. 7.33). In all of these countries and a few additional countries, lung cancer is the leading cause of cancer death. Incidence rates increase exponentially with age, and rates are substantially higher in males than in females, with some exceptions, such as Abidjan (Côte d'Ivoire) and
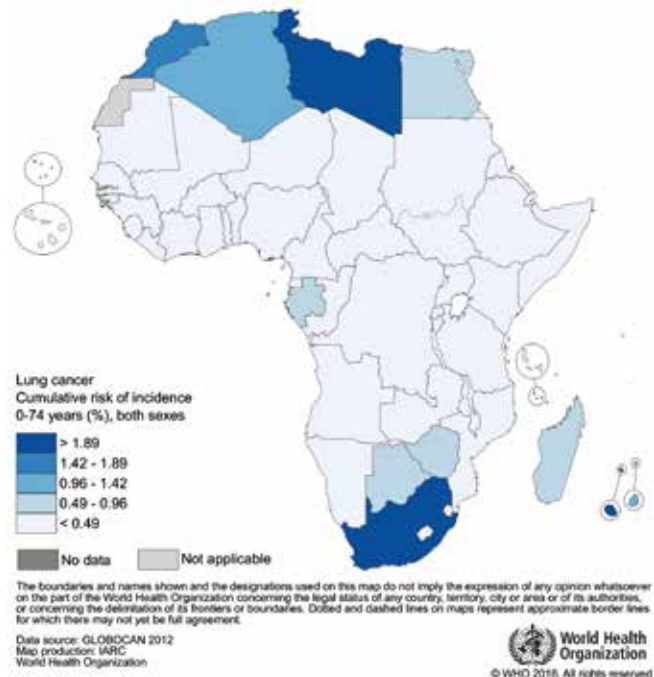

Fig. 7.33. Cumulative risk (up to and including the age of 74 years) of cancer of the trachea, bronchus, and lung among both sexes in Africa, expressed as a percentage, by country

Kyadondo County (Uganda), where rates are generally similar between males and females.

Few studies have been published on temporal trends in lung cancer rates in Africa, and these studies showed decreasing rates in males in rural Eastern Cape (South Africa) and in the Black population of Zimbabwe (Chokunonga et al., 2013; Somdyala et al., 2015), and increasing rates in women in Kampala (Uganda) (Wabinga et al., 2014). Notwithstanding the lack of trend data, the substantial variation in lung cancer incidence rates across countries and between men and women reflects differences in the degree of the tobacco epidemic. In 2012, > 25% of men in parts of northern Africa and southern Africa were current smokers, compared with < 10% of men in most of western and central Africa (Ng et al., 2014). In women, in contrast, smoking prevalence was < 5% in almost all parts of Africa (Ng et al., 2014). Despite the large variation in incidence rates within the continent, Africa is the region with the lowest incidence rates in the world. For example, the cumulative risk in men in sub-Saharan Africa in 2012 (0.58%) was less than one sixth of the global average (3.92%). This is because of the early stage of the tobacco epidemic in this region, as well as the low intensity of smoking; in most countries in sub-Saharan Africa, consumption by smokers is < 10 cigarettes per day (Ng et al., 2014). This low intensity is related to the cost of cigarettes, which results in them being purchased as single cigarettes instead of in packs in most parts of Africa.

However, the prevalence and intensity of smoking are expected to increase in both men and women in Africa because of the economic transition (increases in the affordability of cigarettes) and intensified marketing by tobacco companies as they attempt to increase their market share and maximize profits (Drope, 2011). According to findings from the Global Youth Tobacco Survey administered in 2009–2011 in 10 selected countries in Africa, the prevalence of smoking within the previous 30 days in girls and boys aged 13–15 years ranged from 3.4% in Malawi to 13.6% in Côte d'Ivoire for cigarettes and from 8.6% in Niger to 25.4% in Zambia for all tobacco products (Zhao et al., 2015). Notably, in some of these countries, the prevalence of cigarette smoking in girls was as high as in boys and higher than in adults (Eriksen et al., 2015; Ng et al., 2014).

Lung cancer is the most preventable cause of cancer death. In response to the growing tobacco epidemic, the WHO Member States adopted the WHO Framework Convention on Tobacco Control (FCTC) in 2005 (WHO, 2005b). As of April 2016, 43 of the 47 countries in the WHO African Region are parties to the FCTC; the non-parties are Eritrea, Malawi, Mozambique, and South Sudan (Framework Convention Alliance, 2017). Husain et al. (2016) examined the status of tobacco control efforts in 2014 relative to the provisions of the WHO FCTC and the MPOWER package (six evidence-based tobacco control measures that are most effective in reducing tobacco use) in 23 African countries and found large variations in the overall FCTC implementation rates, ranging from 9% in Sierra Leone to 78% in Kenya. Another recent study showed that implementation of tobacco policies as suggested by WHO in western African countries, although at low levels, was correlated with reduced smoking prevalence (Winkler et al., 2015). These findings underscore the continued need for broad implementation of the FCTC provisions to curb the growing burden of lung cancer and other smoking-related diseases in Africa.
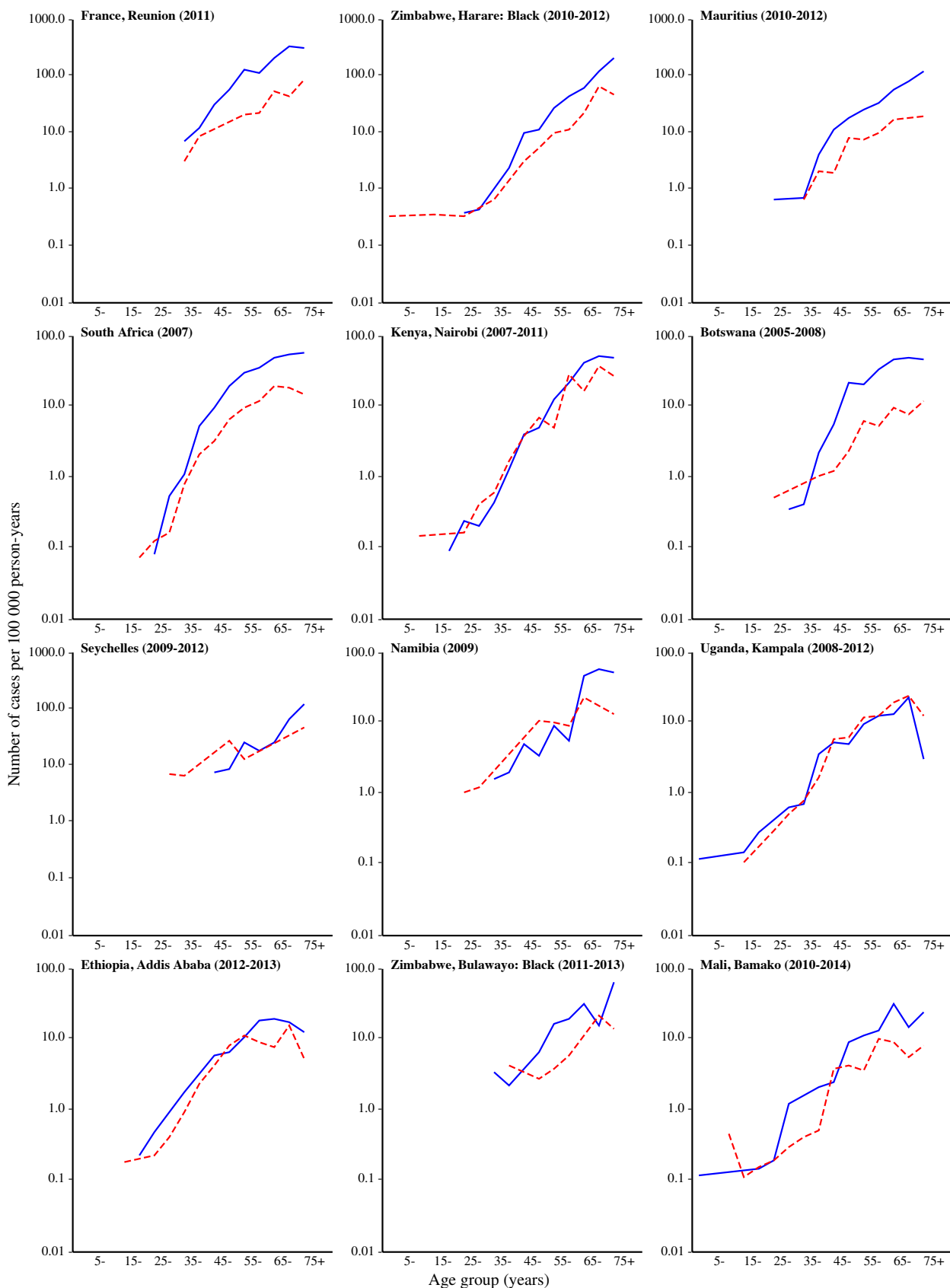
Trachea, bronchus, and lung (C33-34)

Fig. 7.34. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the trachea, bronchus, and lung among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

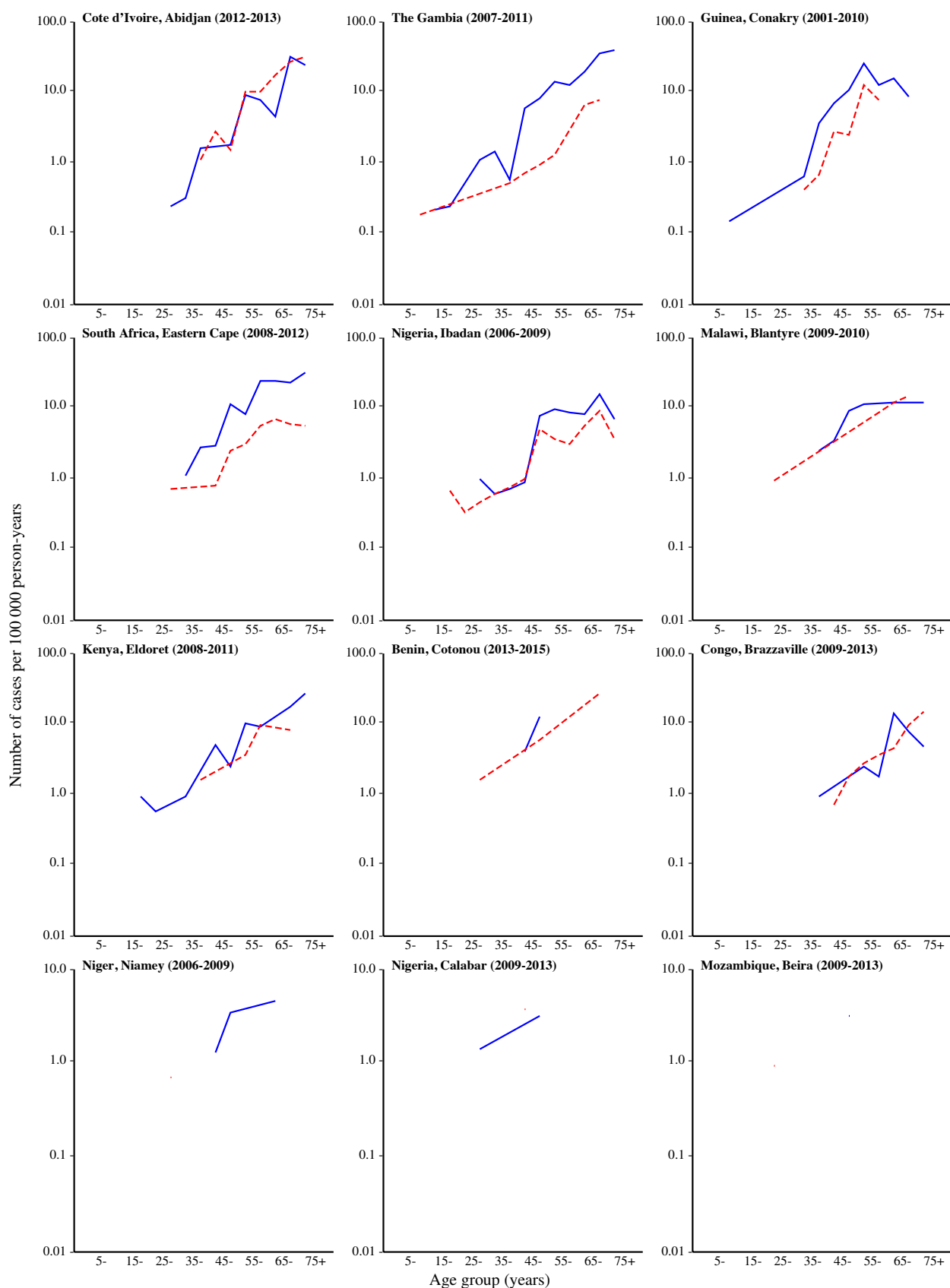# Trachea, bronchus, and lung (C33-34)

Fig. 7.34 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the trachea, bronchus, and lung among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Leukaemia

An estimated 15 200 new cases and 13 700 deaths from leukaemia occurred in sub-Saharan Africa in 2012, making it the 14th most common cancer type. Leukaemia is slightly more common in males than in females (sex ratio, 1.2), and about one fifth of the cases occurred in the childhood age range.
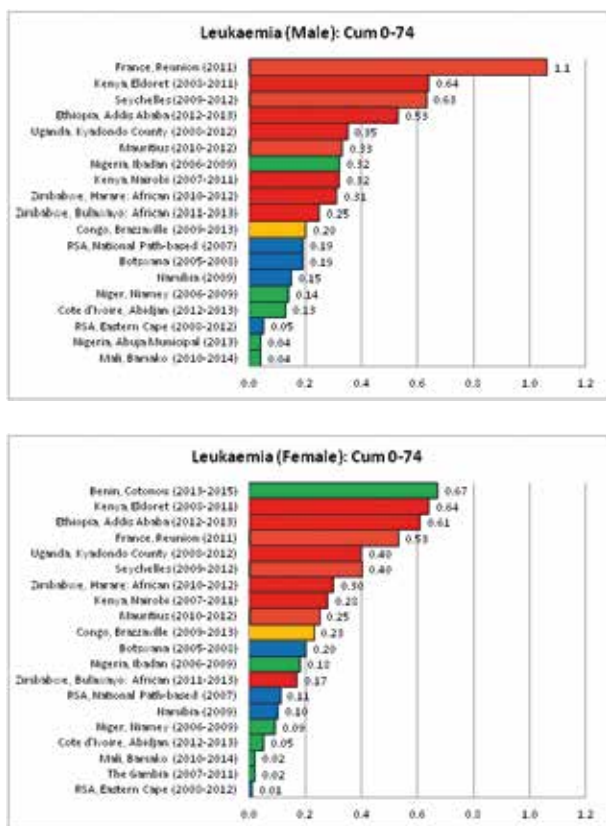

Fig. 7.35. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of leukaemia among males and females in sub-Saharan Africa, by registry population

Overall, incidence rates are much lower than those observed in developed countries. GLOBOCAN 2012 gives the following estimates of cumulative incidence rate (up to and including the age of 74 years): world, 0.44%; more developed regions, 0.69%; less developed regions, 0.34%; Africa, 0.30%; sub-Saharan Africa, 0.25% (Ferlay et al., 2013).

With respect to the rates recorded in the cancer registries, the incidence appears to be higher in eastern Africa, although the highest cumulative incidence rate in females (0.67%; 95% confidence interval: 0.24–1.10) was recorded in Cotonou (Benin). Of note are the relatively high incidence rates in Addis Ababa (Ethiopia), where leukaemia is the second most common cancer in males (after colorectal cancer) and the fourth most common cancer in females.
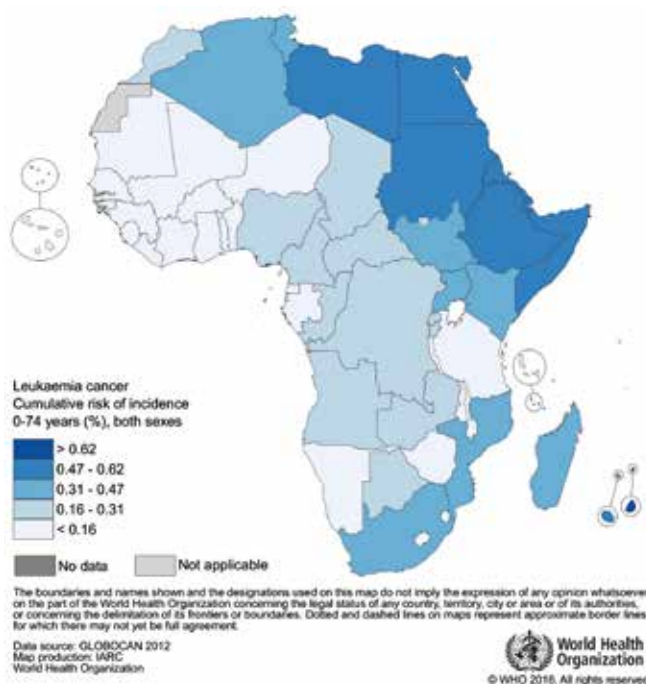

Fig. 7.36. Cumulative risk (up to and including the age of 74 years) of leukaemia among both sexes in Africa, expressed as a percentage, by country

It is possible that the low incidence rates reported by some cancer registries are due to deficiencies in the availability of diagnostic services of clinical haematology, or, when these exist, the failure of the registries to identify haematological malignancies.

Most descriptions of leukaemia in Africa are based on clinical series; therefore, it is difficult to know how much the age structure of the population and selective factors such as access to hospitals and diagnostic facilities, and the technical diagnostic methods available, influence the reported patterns.

The older literature (until 1985) was summarized by Fleming (1986). In many series, chronic leukaemias apparently outnumbered acute leukaemias, and in early series from western Africa, chronic myeloid leukaemias appeared to be more frequent than chronic lymphoid leukaemias (Edington & Hendrickse, 1973; Williams, 1985). The ratio between lymphoid and myeloid leukaemias is variable, but in general there is no excess of lymphoid leukaemias, as is observed in high-income countries.

Although there are many reports suggesting that human T-cell lymphotropic virus type I (HTLV-I) seroprevalence rates are elevated in several African countries, only a few epidemiological studies of acute T-cell leukaemia/lymphoma are available; it appears to be relatively rare (Iwanaga et al., 2012).
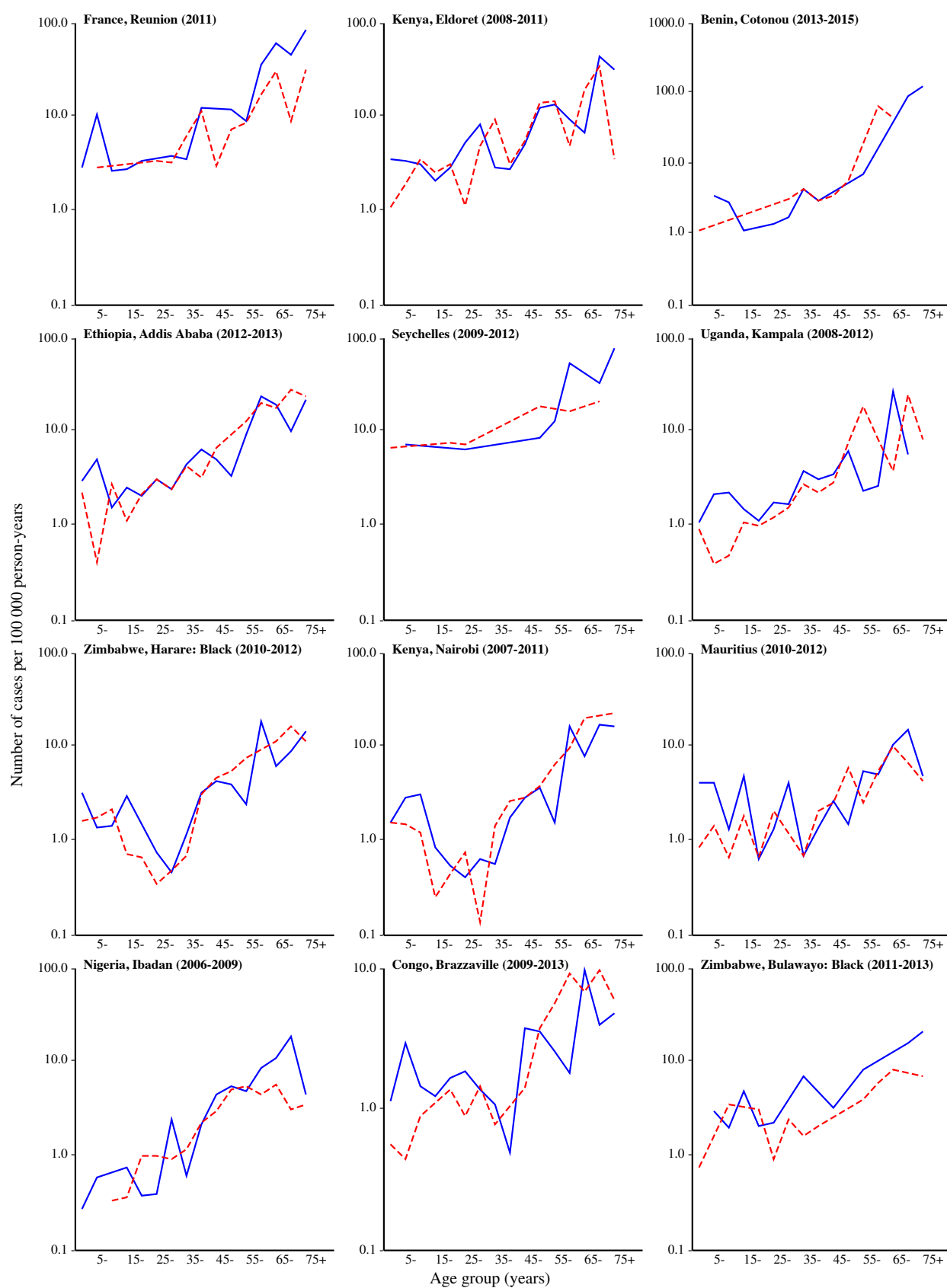
Leukaemia (C91-95)

Fig. 7.37. Age-specific incidence rates (expressed as cases per 100 000 person-years) of leukaemia among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
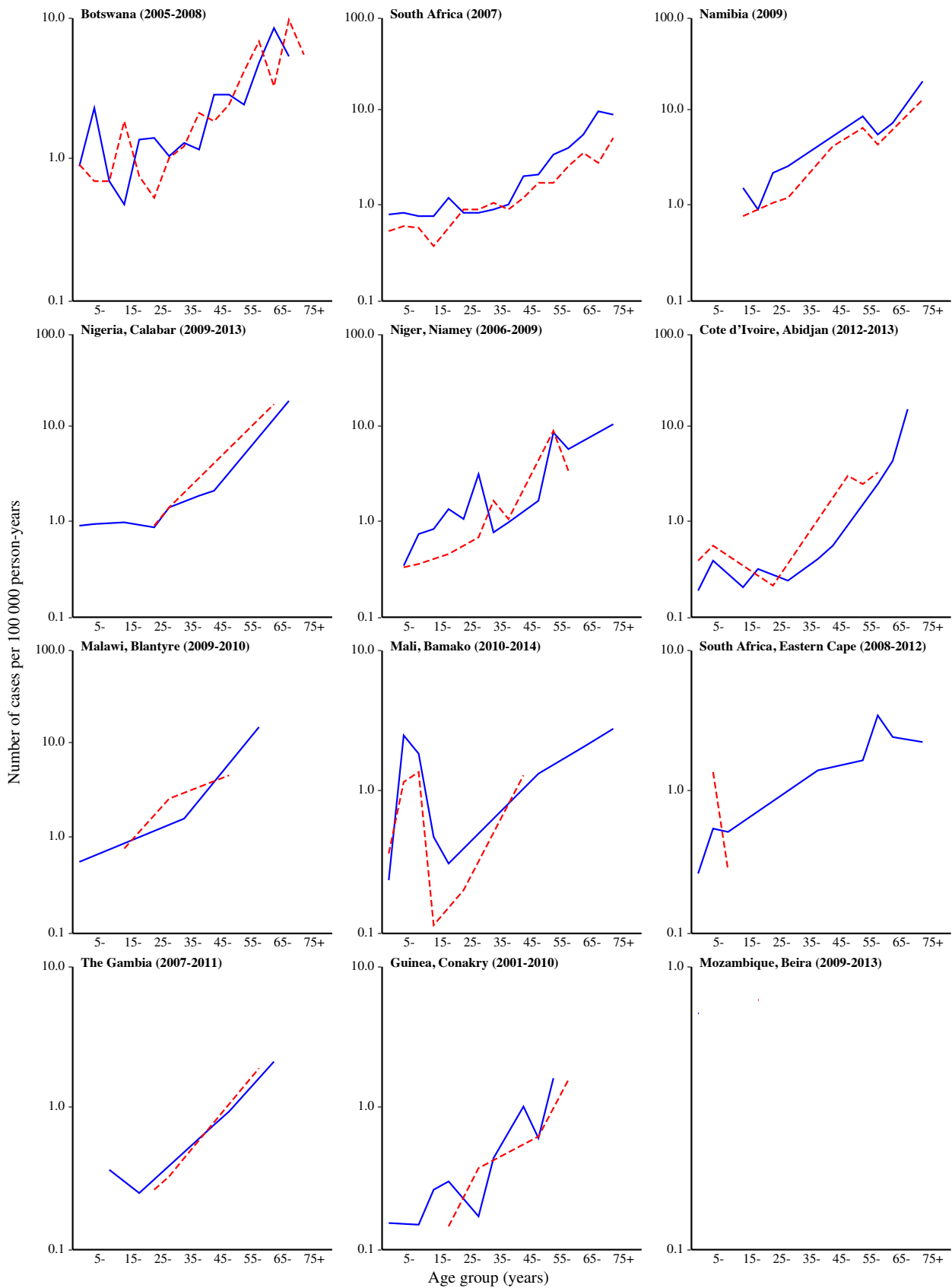
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Leukaemia (C91-95)

Fig. 7.37 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of leukaemia among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the lip and oral cavity

Cancers of the oral cavity (C00–06, including lip, tongue, and mouth cancers), plus the relatively rare malignant tumours of salivary glands (C07–08), were responsible for an estimated 13 500 cases of cancers of the oral cavity and pharynx in sub-Saharan Africa in 2012 (3.6% of all cancers combined), with 64% of tumours occurring in males.
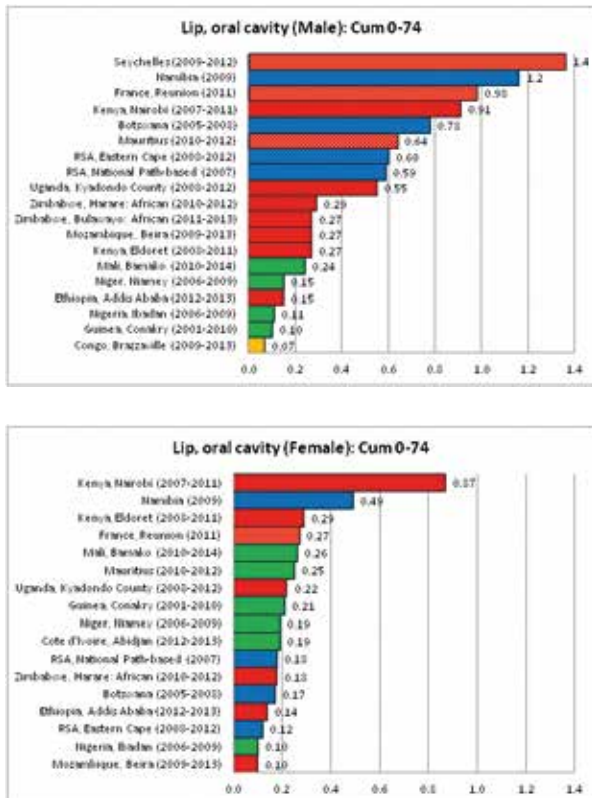

Fig. 7.38. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the lip and oral cavity among males and females in sub-Saharan Africa, by registry population
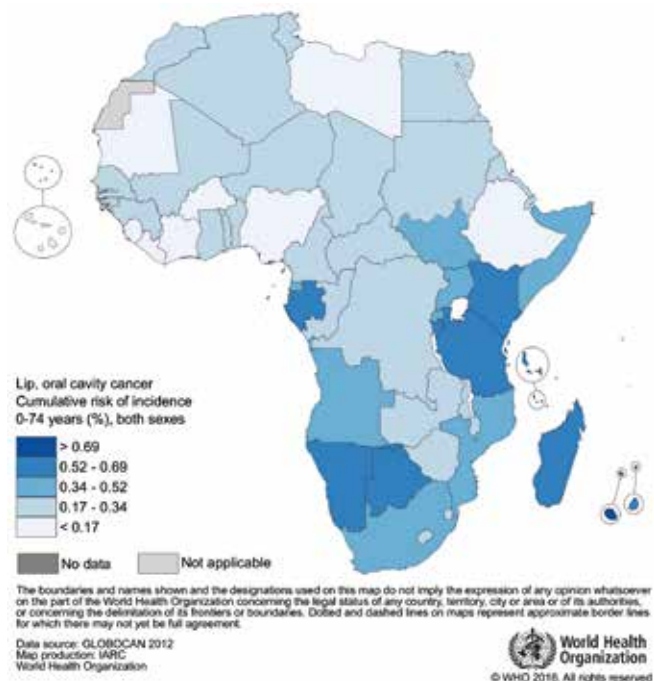

Fig. 7.39. Cumulative risk (up to and including the age of 74 years) of cancer of the lip and oral cavity among both sexes in Africa, expressed as a percentage, by country

The cumulative risk of incidence is < 0.5% in most registry populations in sub-Saharan Africa in both sexes, although the risk is almost 1% in Nairobi (Kenya), Réunion (France), and Namibia in males, and an elevated risk is also seen in females (Fig. 7.38). However, the cumulative incidence of oral cancer in males was highest in Seychelles (1.4%); the cumulative incidence of oral cancer in females was highest in Nairobi (0.9%).

Age-specific incidence rates tend to increase linearly with age (Fig. 7.40). In some registry populations, there is a clear male preponderance at every age: Botswana, Eastern Cape (South Africa), Namibia, Réunion (France), and Seychelles. In others, rates are similar across ages: the Black population of Harare (Zimbabwe), Conakry (Guinea), and

Brazzaville (Congo). In Bamako (Mali), rates appear elevated in females in older age groups. Based on the GLOBOCAN 2012 estimates, rates in both sexes are highest in Mozambique, Madagascar, and Seychelles (Fig. 7.39).

The patterns probably reflect the historical and current prevalence of the major risk factors: use of tobacco (either by smoking or in chewed form) and alcohol consumption. These two risk factors combine multiplicatively in increasing the risk of cancers of the oral cavity and pharynx. Diets that are limited in intake of fruit and vegetables may also have a role in increasing risk, and human papillomaviruses (HPVs) are a major cause of a subset of cancers of the oral cavity and pharynx (including the oropharyngeal region, the tonsils, and the base of the tongue).

The relatively high rates observed in Nairobi (Kenya) are not the result of higher risks in the population of Asian (Indian) ancestry (Korir et al., 2017); indeed, it was noted some decades ago that chewing habits (tobacco with or without betel) were relatively uncommon in Asians in Kenya (Chopra et al., 1975).

Lip cancer is a rare tumour in sub-Saharan Africa, because it affects mainly Caucasians; these cancers develop through exposure to solar radiation (Safe Work Australia, 2010) or the transfer of heat from using pipes to smoke or resting a cigarette on the lower lip while smoking (Czerninski et al., 2010).
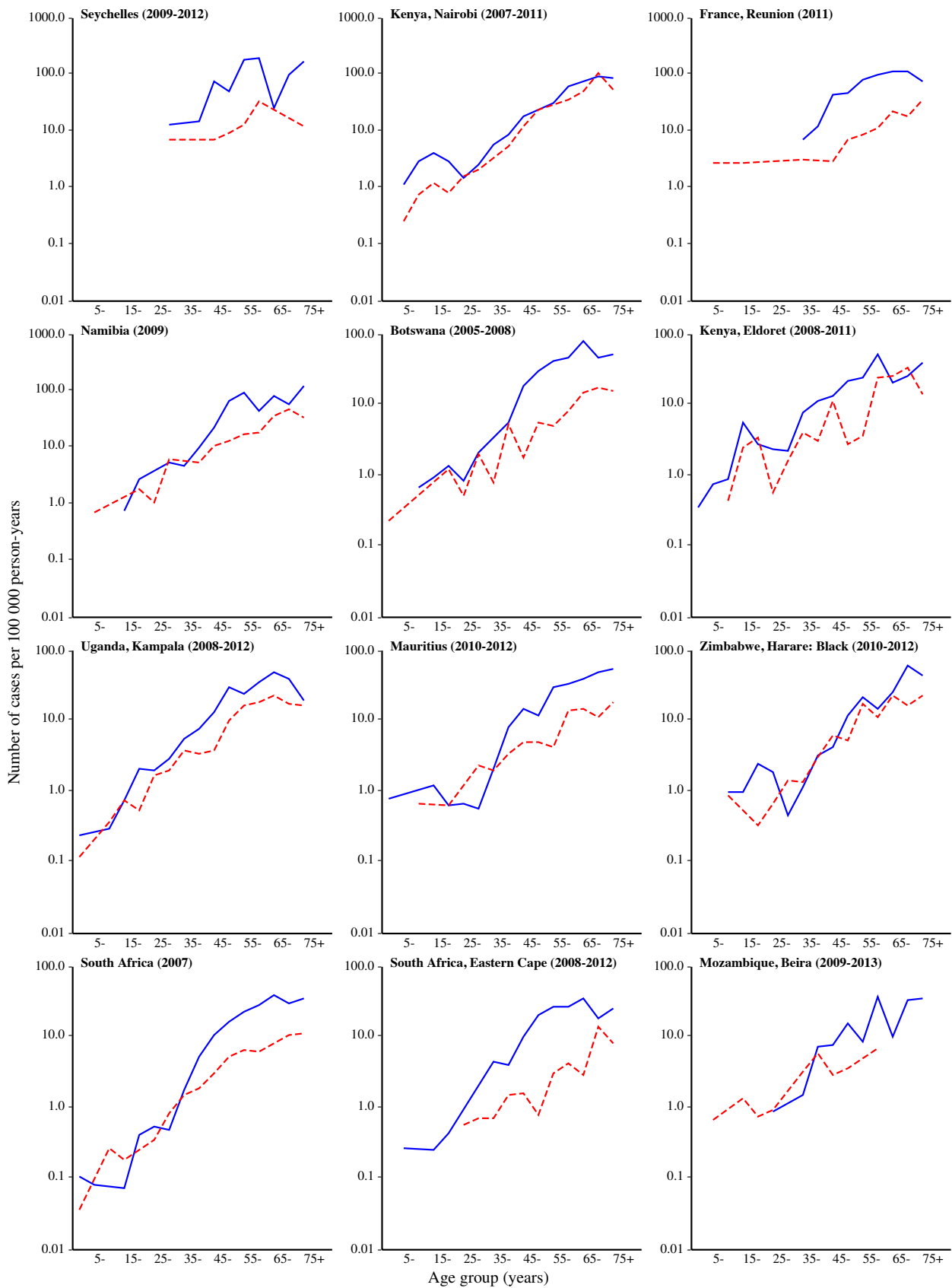
Lip, oral cavity, and pharynx (C00-14)

Fig. 7.40. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the lip, oral cavity, and pharynx among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
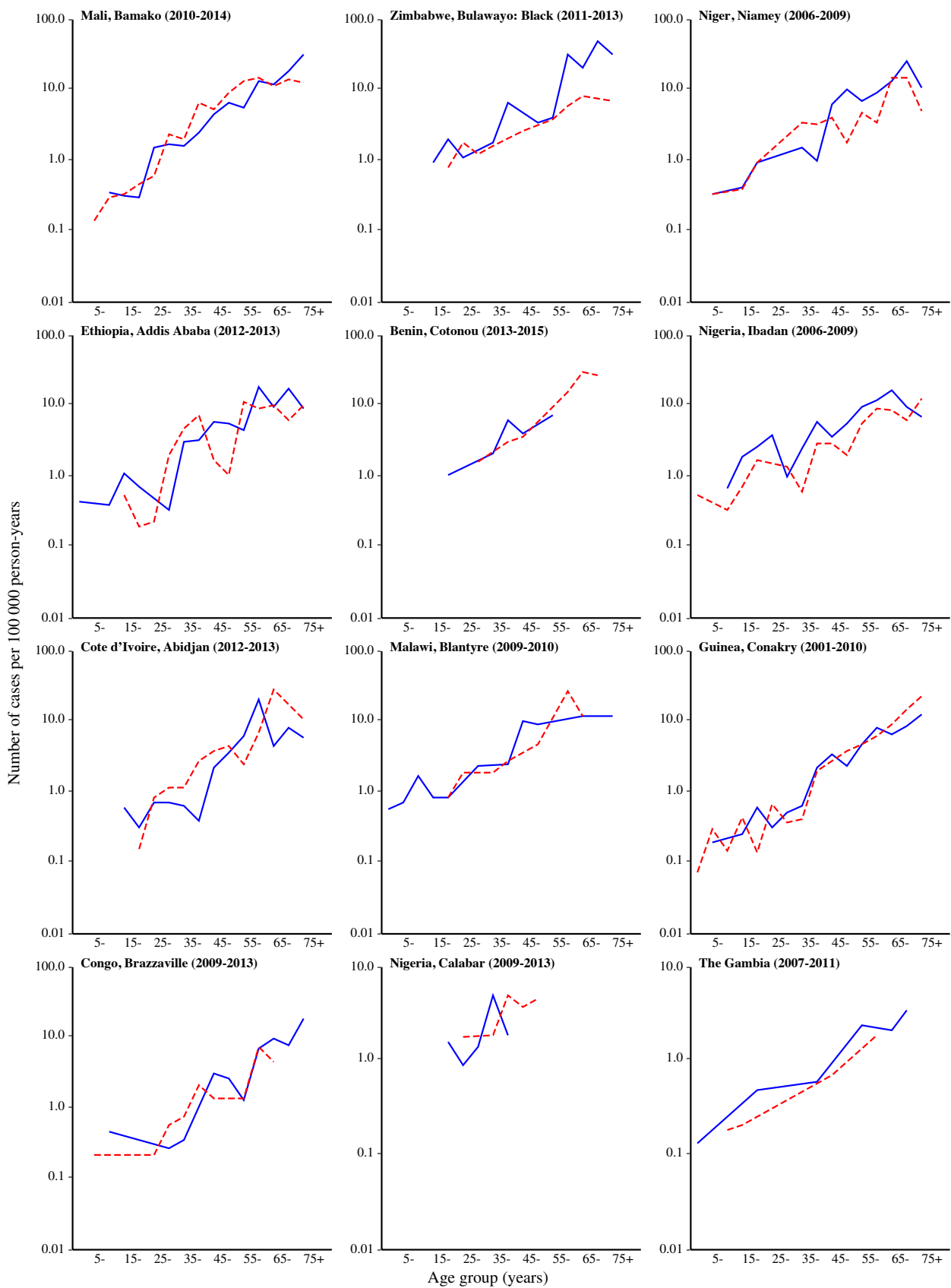
Lip, oral cavity, and pharynx (C00-14)

Fig. 7.40 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the lip, oral cavity, and pharynx among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the ovary

More than 12 500 cases of ovarian cancer were estimated to have occurred in sub-Saharan Africa in 2012, representing 2% of all cancer cases. Ovarian cancer is the sixth most common neoplasm in females and the 13th most common in both sexes combined.
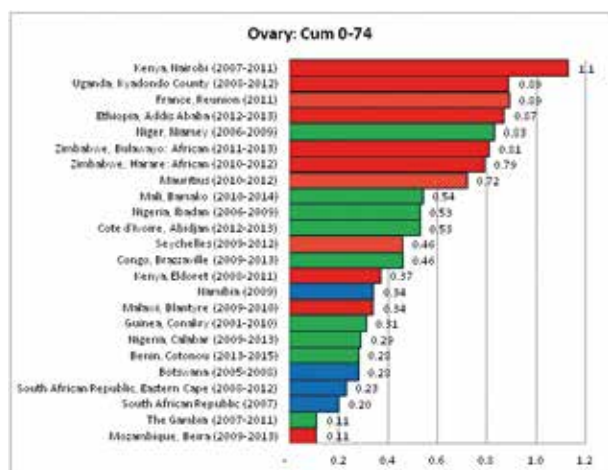

Fig. 7.41. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the ovary among females in sub-Saharan Africa, by registry population
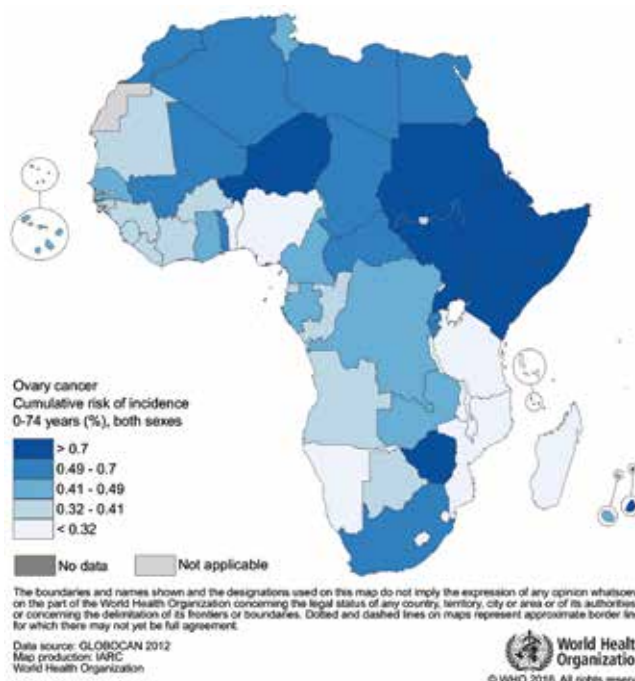

Fig. 7.42. Cumulative risk (up to and including the age of 74 years) of cancer of the ovary among females in Africa, expressed as a percentage, by country

The cumulative risk varies 10-fold in the region (Fig. 7.41), with a 5–10-fold difference in cumulative incidence rates in the registry populations; in most of the populations, these risks are equivalent to < 1 cancer in 200 being diagnosed as being ovarian, although risks approaching 1% or greater, as observed in Addis Ababa (Ethiopia), Réunion (France), Kyadondo County (Uganda), and Nairobi (Kenya), are similar to those seen in the highest-risk populations in Europe, for example in the Nordic countries (Klint et al., 2010). Estimated national rates tend to be elevated in much of eastern Africa, including Mauritius (0.95%), Ethiopia, Uganda, Zimbabwe, and Kenya (Fig. 7.42). The high rate in Niger is an estimate based on results from the registry of Niamey (Fig. 7.41); however, two thirds of the cases in this registry were diagnosed without morphological proof. Low incidence rates are recorded by those registries that rely solely on pathological diagnoses: Beira (Mozambique) and South Africa.

Although there is some variability due to the relative rarity of ovarian cancer, the age-specific patterns indicate that the rate of increase diminishes at postmenopausal ages, following the Pike model of a rapidly increasing rate of "effective tissue ageing" at menarche and steep declines at menopause (Pike et al., 2004).

In broad terms, the vast majority of ovarian cancers are epithelial in origin. Early age at menarche, late age at menopause, ovulation (lifetime number of menstrual cycles), nulliparity, low parity, and use of hormone therapy at menopausal ages increase the risk of ovarian cancer, whereas use of combined oral contraceptives is protective. Genetic predisposition is responsible for 10% of cases of ovarian cancer. It is not clear the extent to which a higher or lower prevalence of each of these epidemiological risk factors affects the current cancer profile in sub-Saharan Africa. It is worth noting that ovarian cancer is a leading cause of cancer in women in The Gambia (Bah et al., 2001) and rural South Africa (Somdyala et al., 2015), despite the relatively low rates. The changes that are occurring in reproductive patterns and behaviour signify that rates of ovarian cancer are likely to increase in the future in many countries in the region.
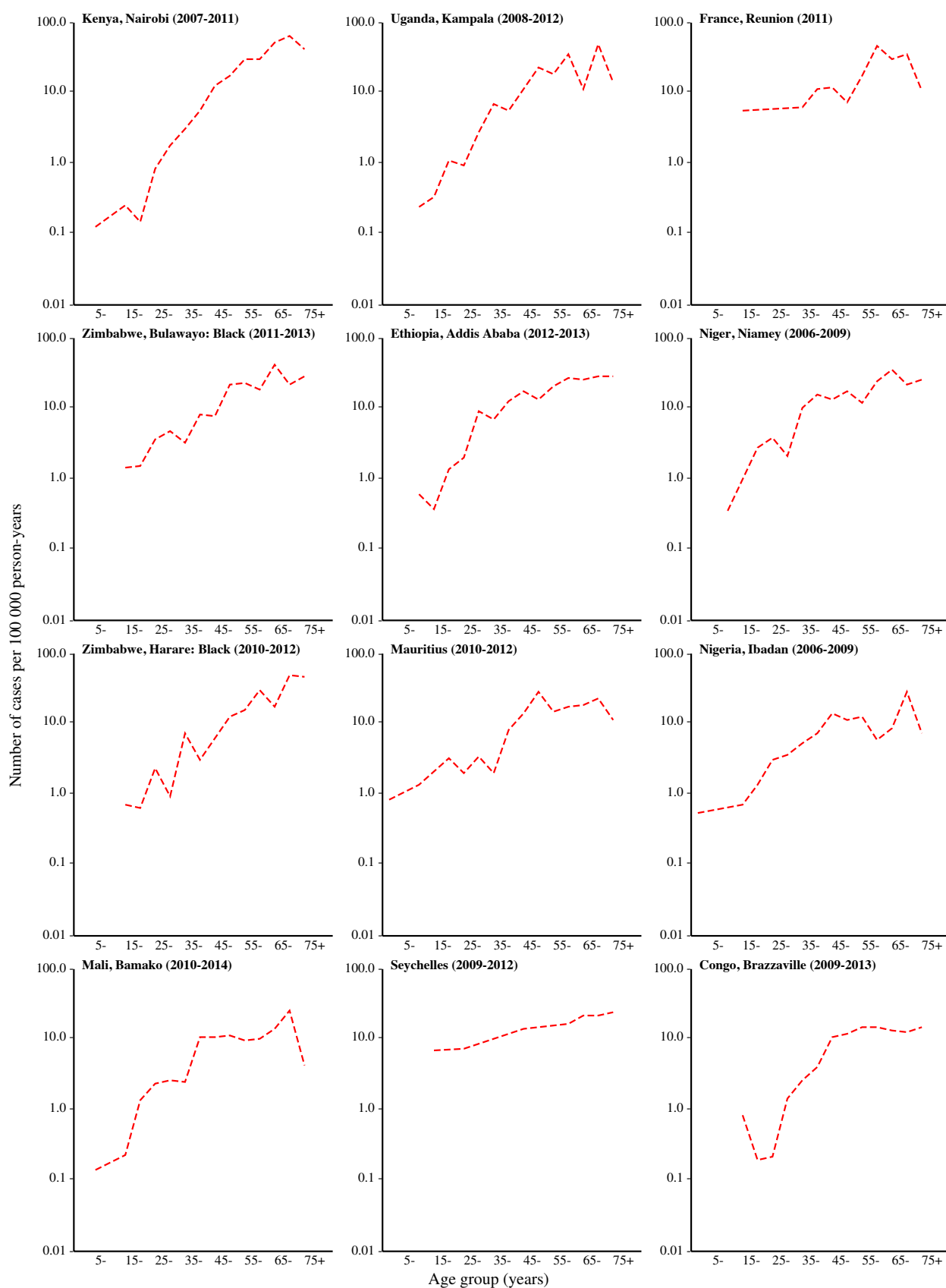
Ovary (C56)

Fig. 7.43. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the ovary among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
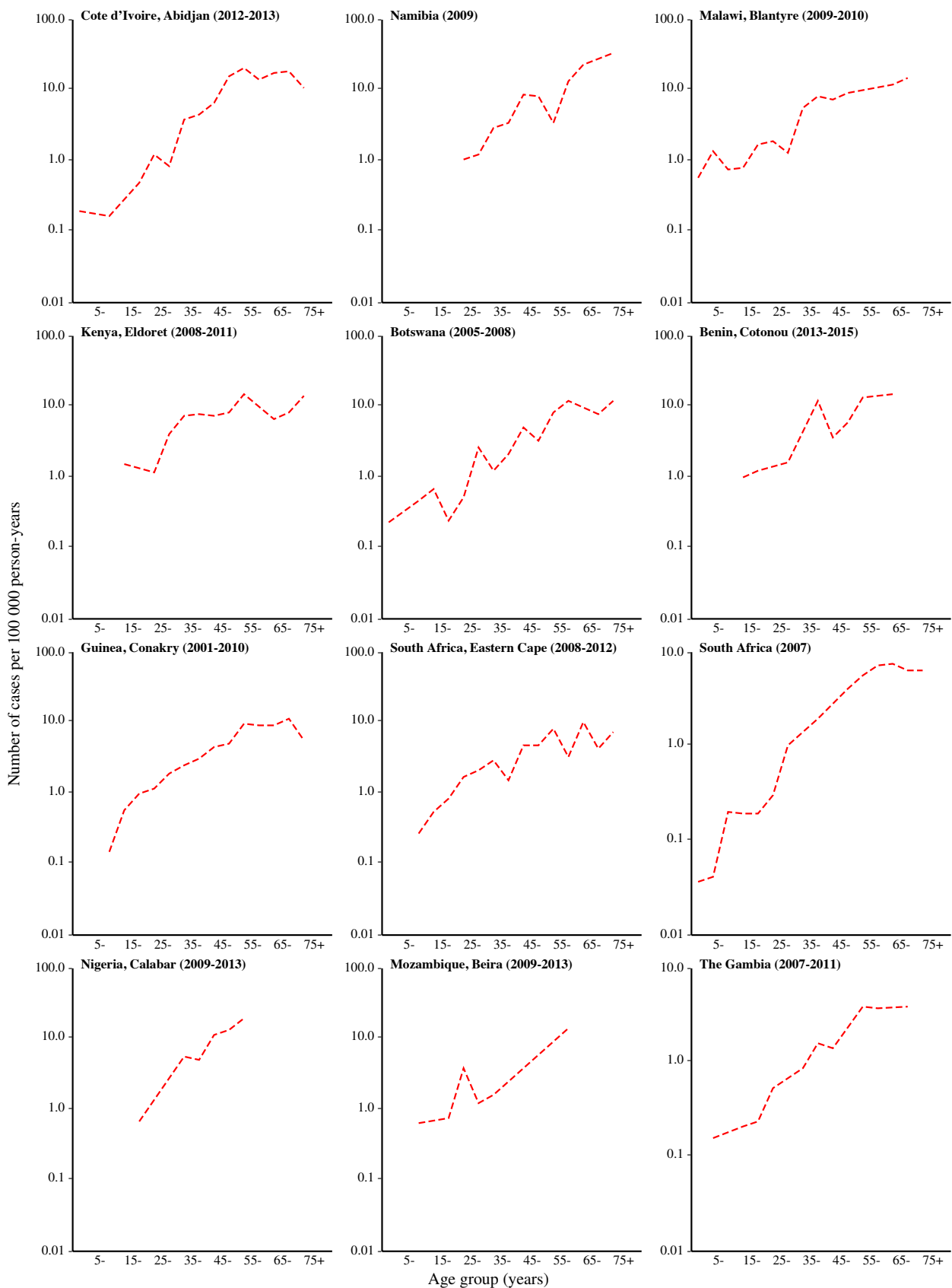
Ovary (C56)

Fig. 7.43 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the ovary among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the bladder

With an estimated 10 500 new cases in 2012 (1.7% of all cancer cases), bladder cancer is the 15th most commonly diagnosed cancer in sub-Saharan Africa in both sexes, but it ranks within the top 10 among males. More than 60% of bladder cancers are diagnosed in males, and although cumulative incidence rates are generally low, a 10–15-fold variation in cumulative risk is observed (Fig. 7.44), with elevated lifetime risks – corresponding to 1 in 100 men being diagnosed with bladder cancer before the age of 75 years – seen in the registry populations of Bamako (Mali) and Blantyre (Malawi). It is worth noting that some of the highest rates of bladder cancer among females worldwide are estimated in these countries (Antoni et al., 2017).
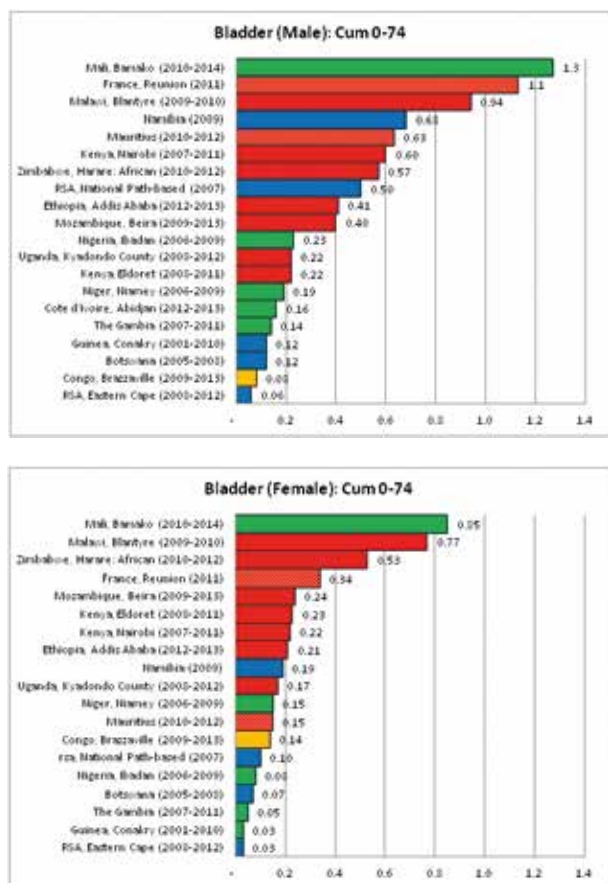

Fig. 7.44. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the bladder among males and females in sub-Saharan Africa, by registry population

Although bladder cancer is the fourth most common neoplasm in males in northern Africa, and rates are striking in certain countries – in Egypt, 1 in 40 men are diagnosed with bladder cancer in a lifetime – the incidence in sub-Saharan Africa tends to be much lower (Fig. 7.45).
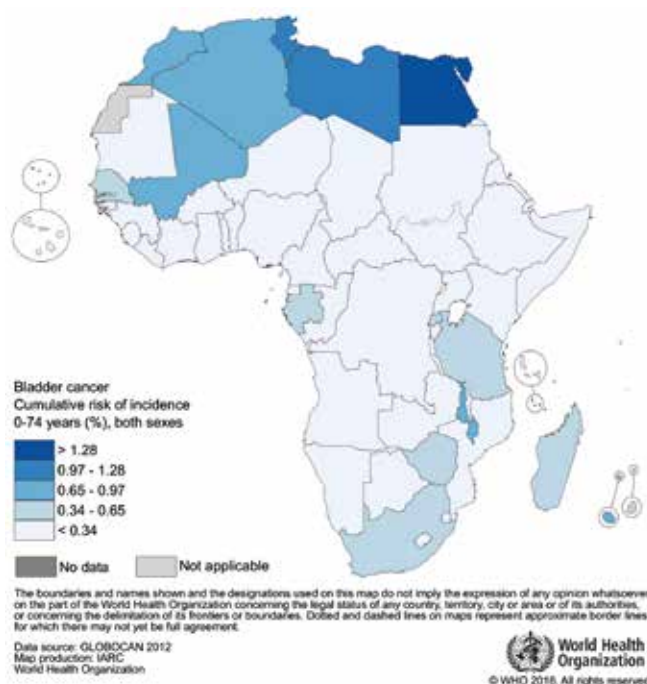

Fig. 7.45. Cumulative risk (up to and including the age of 74 years) of cancer of the bladder among both sexes in Africa, expressed as a percentage, by country

Age-specific patterns indicate some variability across age groups, but generally rates increase with age in a log-linear fashion from age 25 years (Fig. 7.46).

Unlike in most Caucasian populations, where transitional cell carcinomas (TCCs) constitute most new cases of bladder cancer, a greater proportion of bladder cancer cases in Africa are squamous cell carcinomas (SCCs), linked to the prevalence of infection with *Schistosoma haematobium* (IARC, 2012). This divergent pattern by histological subtype is seen in certain western and eastern African countries, including Mali, Malawi, and Zimbabwe (Table 7.01), where *S. haematobium* infection is common. In South Africa, marked differences have been reported between Black (36% SCC, 41% TCC) and White (2% SCC, 94% TCC) populations (Parkin et al., 2003).

Integration of preventive measures that overlap with those for other infections can target populations at high risk (e.g. due to poor hygiene, lack of safe water, and/or inadequate sanitation) and, together with mass drug administration, can control schistosomiasis (Inobaya et al., 2014) and reduce rates of bladder SCC in sub-Saharan Africa. However, with social and economic transitions under way in the region, further urbanization and increases in the prevalence of cigarette smoking in some African countries may lead to an increasing incidence of TCC relative to SCC.

In developed countries, a critical factor in the interpretation of incidence rates has been local registration practices with respect to the coding and reporting of non-invasive (in situ) tumours (Antoni et

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al., 2017), which can constitute a large proportion of all bladder tumours. However, such comparability issues, and divergent practices in cystoscopy, biopsy, and the extent of histological examination of biopsy specimens, are expected to be less important in sub-Saharan Africa, because an incident case usually constitutes a manifestly invasive and often relatively advanced tumour.

Number of microscopically verified cases by histological type
Bladder (C67) - Both sexes (all ages)

| | Carcinoma | | | | | Sarcoma | Other | Unspec. | Number of cases | |
	Squamous	Transitional	Adeno.	Other	Unspec.				MV	Total
Africa, central										
Congo, Brazzaville (2009-2013)	4	1	3	-	7	1	-	-	**16**	33
Africa, east										
Ethiopia, Addis Ababa (2012-2013)	2	51	2	-	3	-	-	3	**61**	80
France, Reunion (2011)	4	41	2	1	-	-	-	2	**50**	58
Kenya, Eldoret (2008-2011)	4	15	2	-	4	1	-	-	**26**	27
Kenya, Nairobi (2007-2011)	7	51	3	-	19	3	-	1	**84**	105
Malawi, Blantyre (2009-2010)	28	2	3	-	-	-	-	-	**33**	72
Mauritius (2010-2012)	4	102	3	-	16	2	-	5	**132**	136
Mozambique, Beira (2009-2013)	19	-	-	-	5	1	-	-	**25**	29
Seychelles (2009-2012)	1	8	1	-	-	-	-	-	**10**	13
Uganda, Kampala (2008-2012)	5	14	2	-	4	1	-	2	**28**	59
Zimbabwe, Bulawayo: Black (2011-2013)	-	3	1	-	2	-	-	-	**6**	16
Zimbabwe, Harare: Black (2010-2012)	22	15	1	1	2	1	-	-	**42**	84
Africa, south										
Botswana (2005-2008)	4	17	5	-	2	1	-	-	**29**	33
Namibia (2009)	7	34	3	-	1	-	-	-	**45**	45
South Africa (2007)	53	767	26	3	34	8	2	-	**893**	893
South Africa, Eastern Cape (2008-2012)	-	9	1	-	1	-	-	-	**11**	16
Africa, west										
Benin, Cotonou (2013-2015)	-	1	1	-	1	-	-	-	**3**	9
Cote d Ivoire, Abidjan (2012-2013)	-	1	-	-	3	-	-	2	**6**	25
The Gambia (2007-2011)	2	2	1	-	-	-	-	4	**9**	30
Guinea, Conakry (2001-2010)	4	12	4	1	4	1	-	5	**31**	33
Mali, Bamako (2010-2014)	151	63	19	2	55	5	-	17	**312**	429
Niger, Niamey (2006-2009)	6	7	-	-	-	-	1	-	**14**	31
Nigeria, Abuja (2013)	-	5	-	-	-	-	-	-	**5**	5
Nigeria, Calabar (2009-2013)	-	1	1	-	2	-	-	-	**4**	4
Nigeria, Ibadan (2006-2009)	6	22	4	-	1	3	-	-	**36**	44

Table 7.01. Number of microscopically verified cases by histological type – bladder (C67), both sexes, all ages
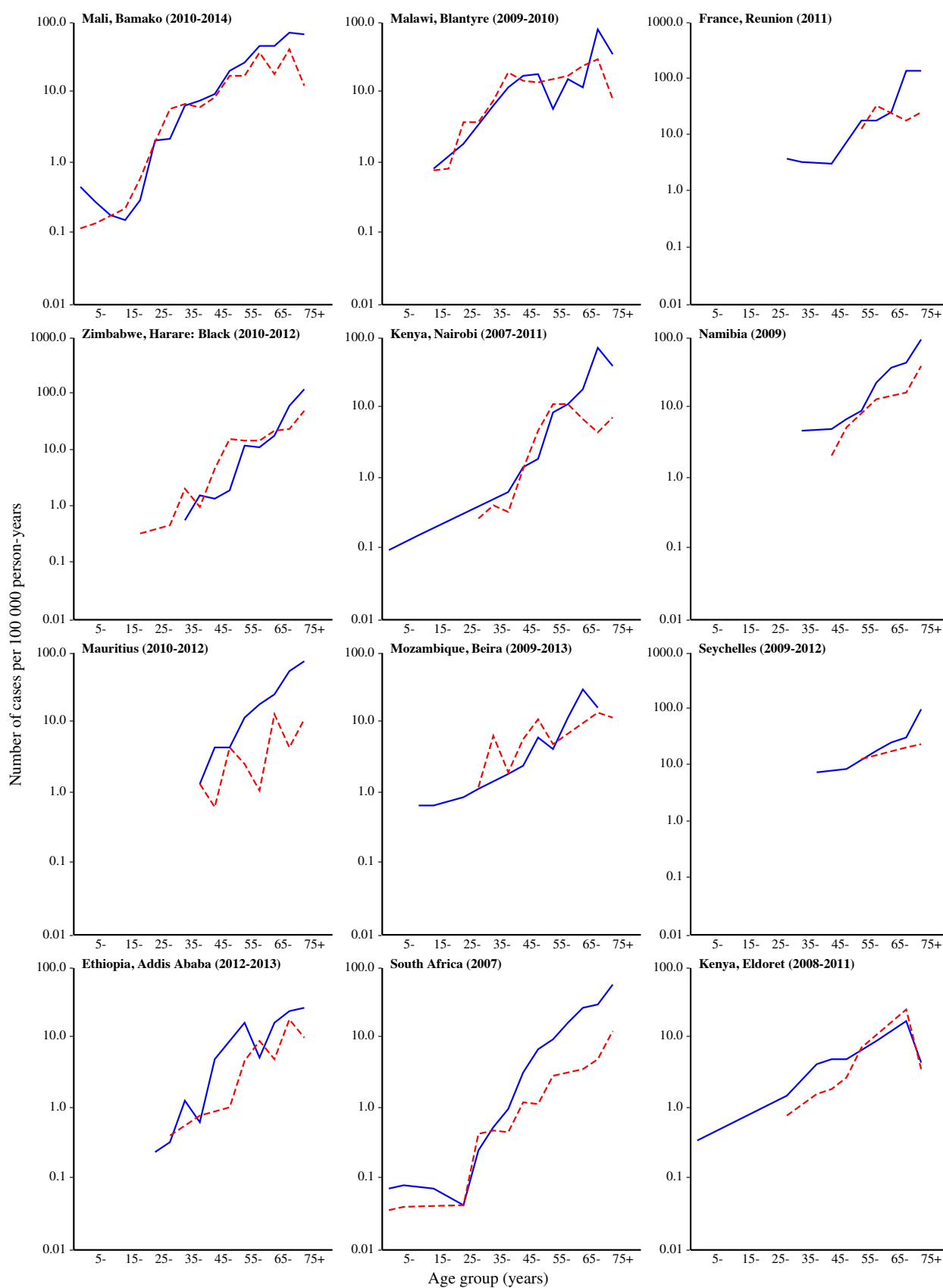
Bladder (C67)

Fig. 7.46. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the bladder among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
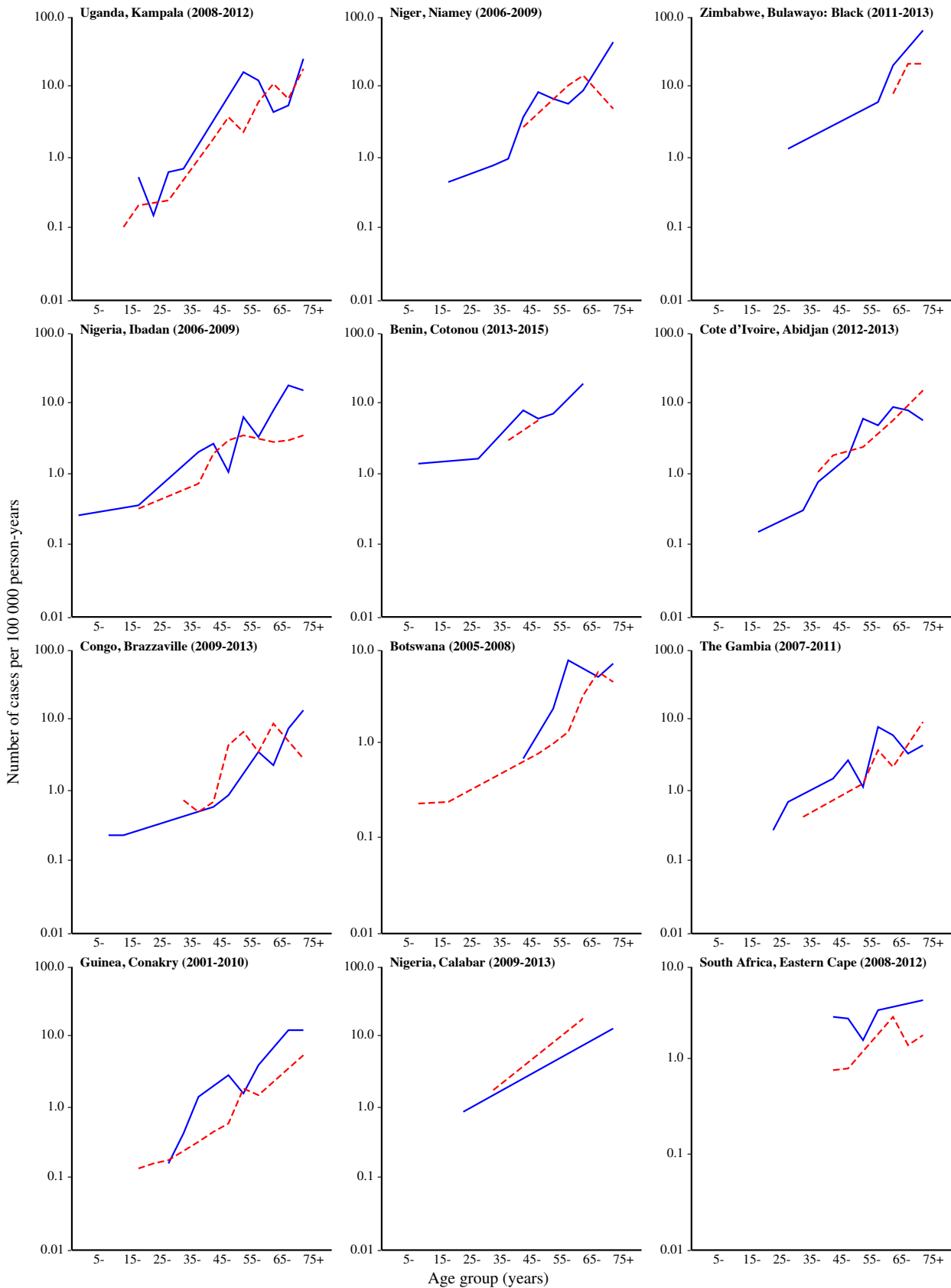
Bladder (C67)

Fig. 7.46 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the bladder among males (solid blue lines) and females (dashed red lines) in 24 of the 25 registry populations of sub-Saharan Africa included in this volume

Cancer of the corpus uteri

There were an estimated 8700 new cases of cancer of the corpus uteri in sub-Saharan Africa in 2012, and a 10-fold variation in cumulative incidence rates among the registry populations (Fig. 7.47); the rates ranged from < 0.2% in The Gambia and Beira (Mozambique) to > 1% in Nairobi (Kenya), Mauritius, and the Black population of Harare and Bulawayo (Zimbabwe).
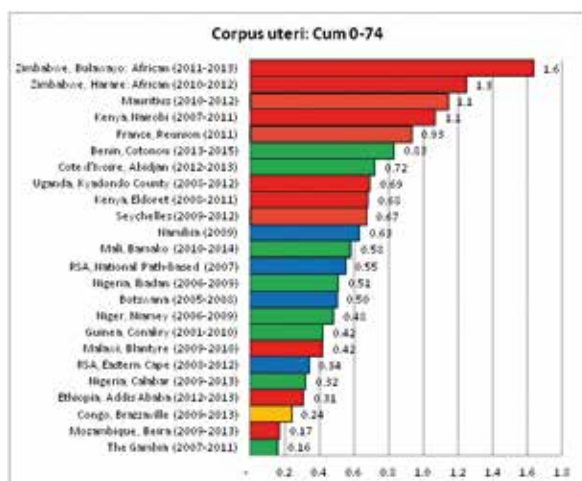

Fig. 7.47. Cumulative incidence rates up to and including the age of 74 years (expressed as percentages) of cancer of the corpus uteri among females in sub-Saharan Africa, by registry population
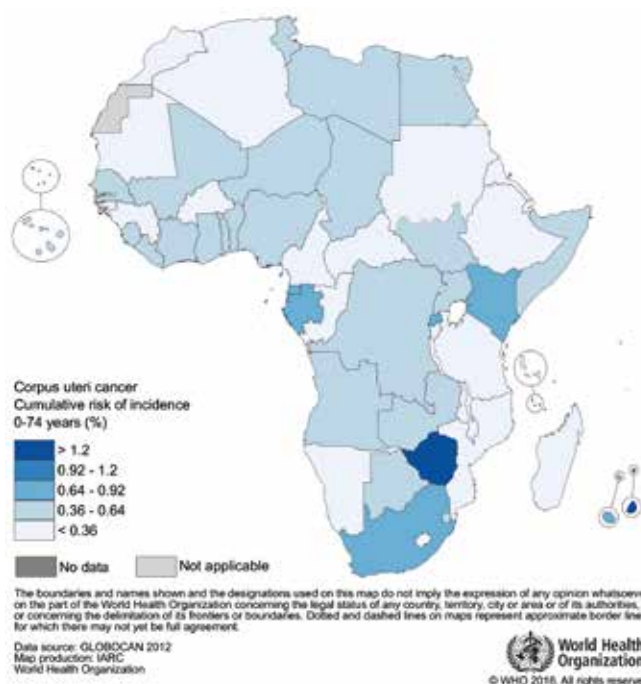

Fig. 7.48. Cumulative risk (up to and including the age of 74 years) of cancer of the corpus uteri among females in Africa, expressed as a percentage, by country

There is little geographical correlation between national estimated rates of cancer of the corpus uteri, although rates tend to be elevated in several eastern African countries (Fig. 7.48), including Mauritius (the highest cumulative risk, at 1.5%), Kenya, Rwanda, and Uganda, as well as in Zimbabwe and South Africa.

Although there is considerable random variation, the age-specific incidence curves reveal increasing rates until postmenopausal ages, followed by a stabilization, or at least a decline in the rate of increase, at a relatively advanced age, at about 60–65 years (Fig. 7.49).

The epidemiology of endometrial cancer, at least from the perspective of developed countries, is fairly well understood. Obesity and family history of endometrial cancer are associated with an increase in risk, whereas high parity and late age at last birth are considered to provide long-lasting protection, as does use of combined oral contraceptives, particularly among long-term users – an observation that was confirmed in a study of Black South African patients by Urban et al. (2012). Use of hormone therapy is an important risk factor in countries where its prescription has been common practice, and smoking appears to be protective. Current incidence patterns in sub-Saharan Africa probably relate mainly to historical and changing reproductive patterns and lifestyle-related factors – particularly overweight and obesity, which is a rapidly increasing problem, especially in urban populations (Ziraba et al., 2009). As with other female cancers under hormonal control (cancers of the breast and ovary), the changes that are occurring in the prevalence of these cancers would indicate that a rising incidence of cancers of the corpus uteri can be expected across the region in future decades.
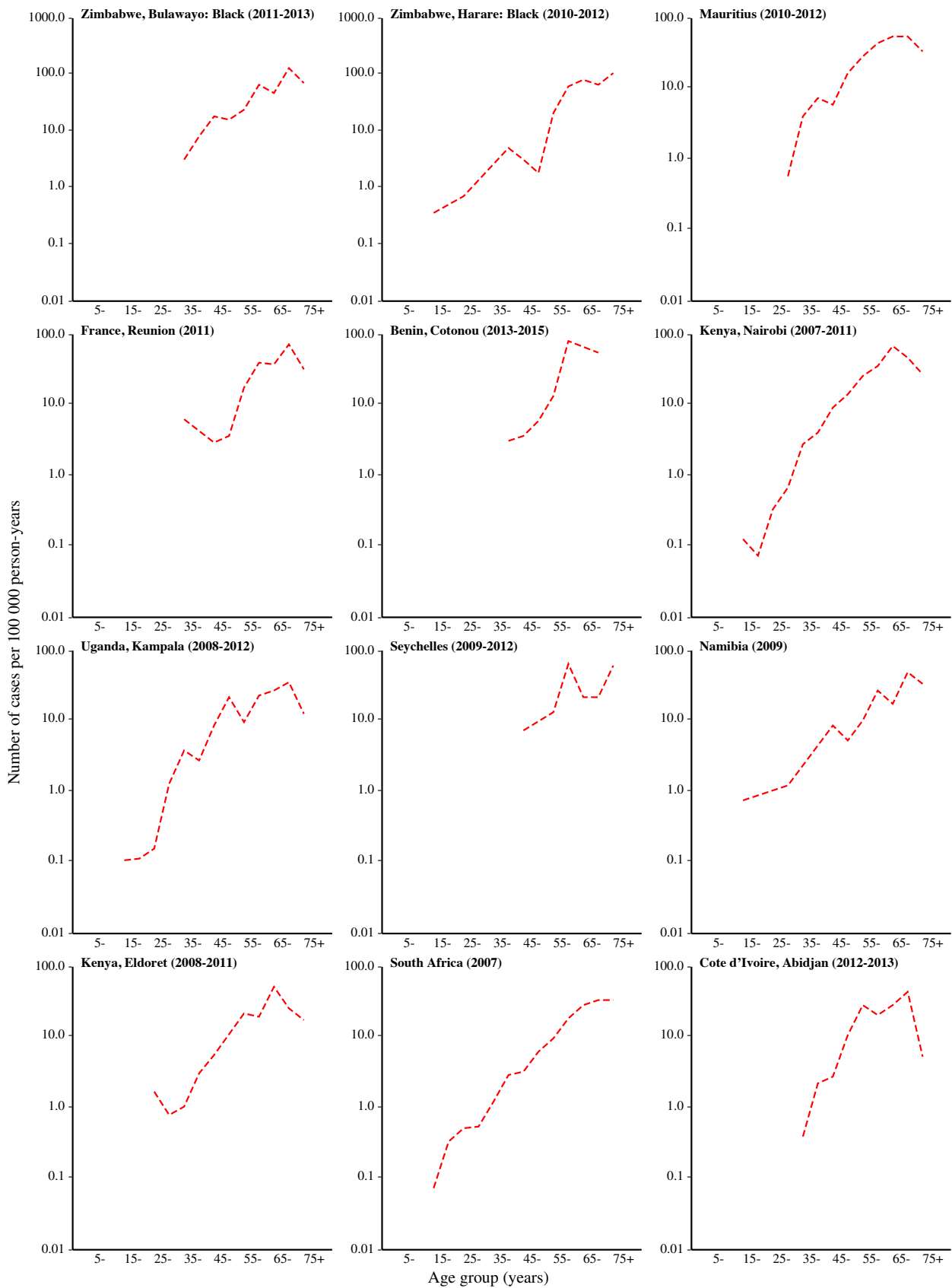
Uterus (C54-55)

Fig. 7.49. Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the uterus among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume
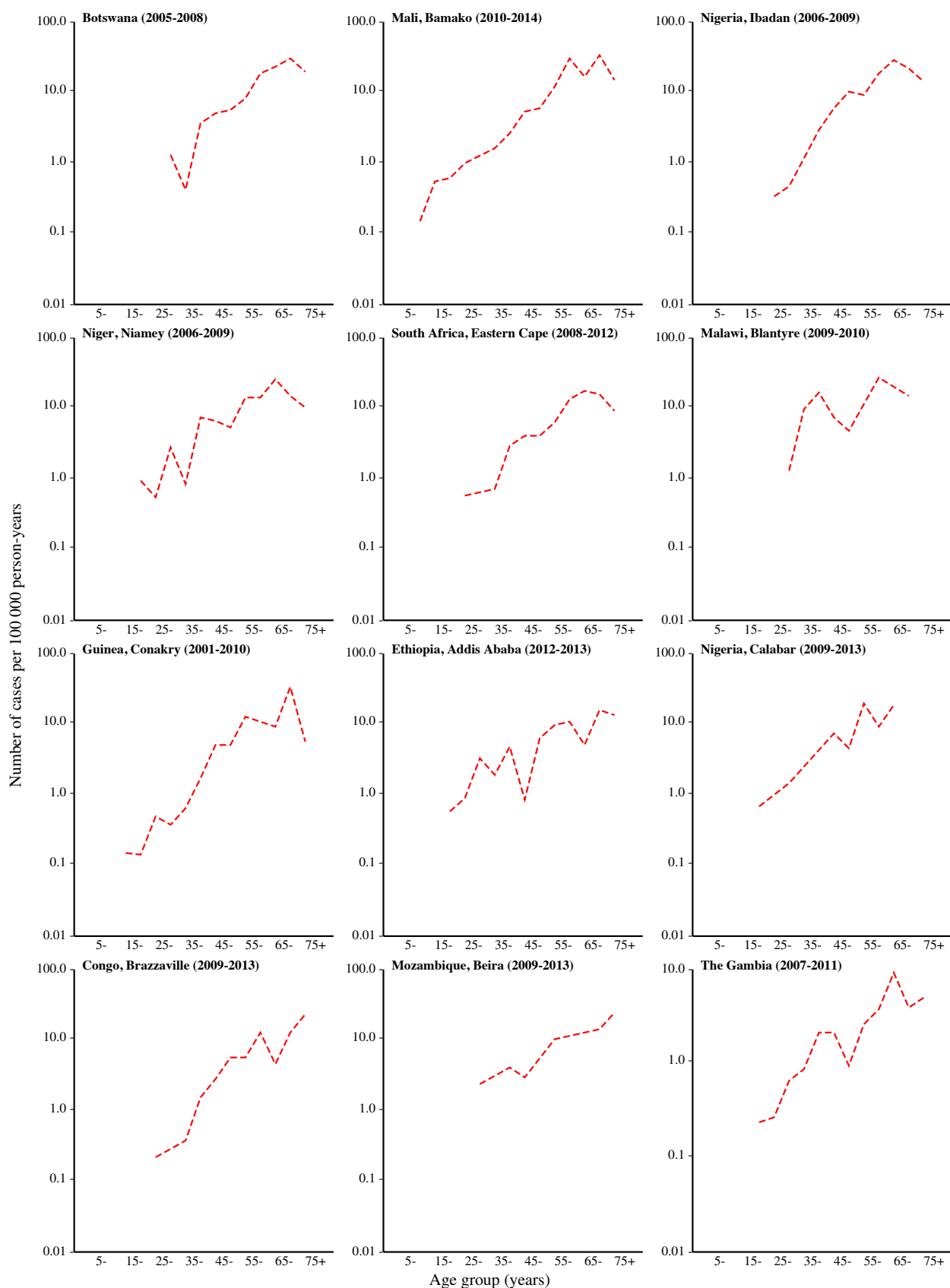
Uterus (C54-55)

Fig. 7.49 (continued). Age-specific incidence rates (expressed as cases per 100 000 person-years) of cancer of the uterus among females in 24 of the 25 registry populations of sub-Saharan Africa included in this volume