CHAPTER 4:

The Research Area

4.1 Introduction

4.1.1 The Province of KwaZulu-Natal

KwaZulu-Natal (KZN) owes its name to the incorporation of KwaZulu, a former Bantustan of the Zulu people into Natal province after the collapse of apartheid in 1994. Natal, meaning Christmas in Portuguese was so named because Vasco da Gama sighted the coast on Christmas day in 1497. The province lies between longitudes 28^0 27' and 32^0 54' E and latitudes 26^0 52' to 31^0 25' S, on the southeastern coast of South Africa. The most eastern point is Kosi Bay at 32^0 54' E, most northern, Nduma at $26^0$52' S, most western, Matatiele at $28^0$47' E and most southern, Port Edward at $31^0$25'S. In total, KZN covers an area of 92 100 square kilometres that makes up 7.6% of the entire area of South Africa (STATSSA, 2004).

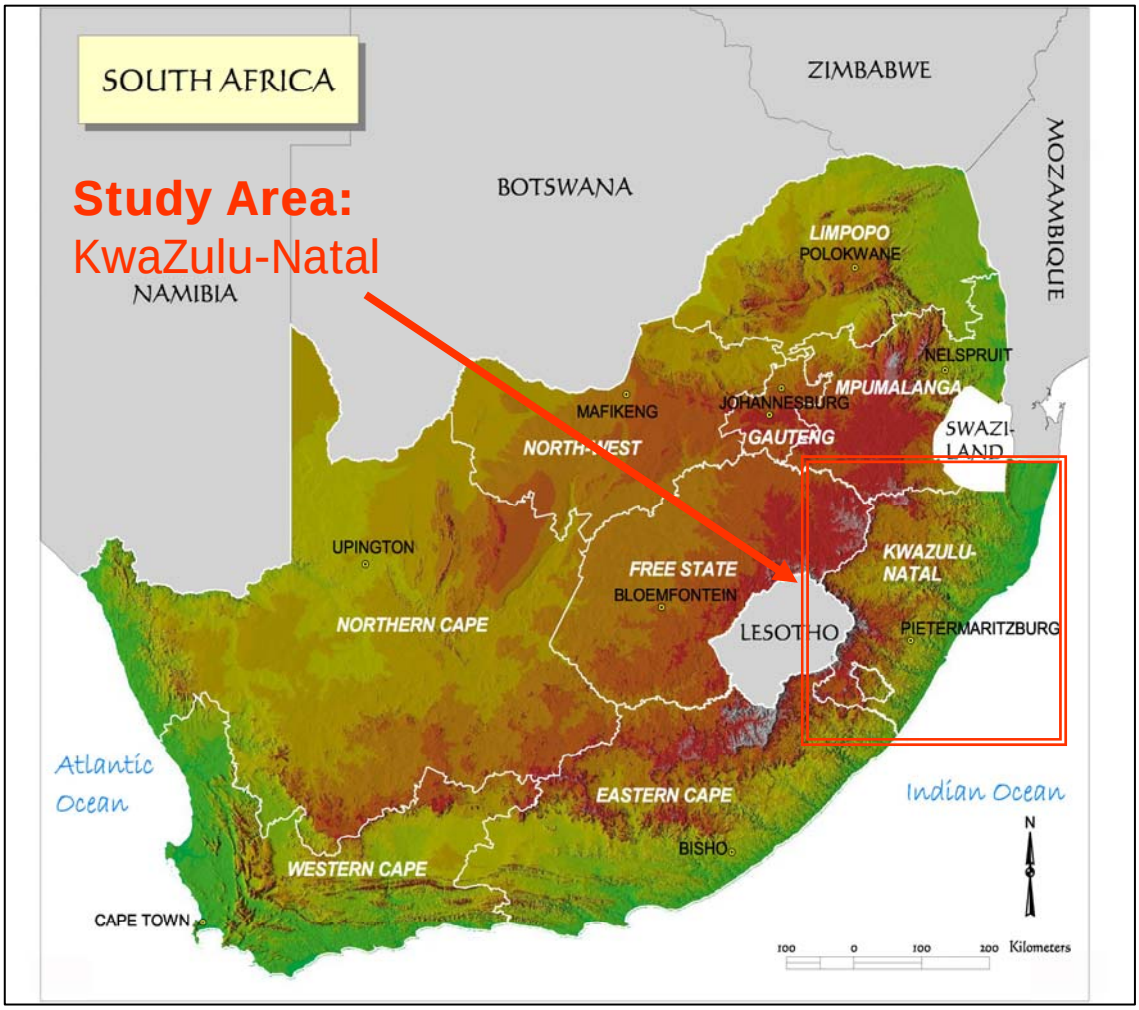


Figure 4.1: Orientation map showing the study area of KwaZulu-Natal in South Africa.

KZN extends from its borders with Swaziland and Mozambique in the north to the Eastern Cape border in the south. Westwards inland, it borders the Kingdom of Lesotho, the Free State and Mpumalanga, which is more towards the northwest. The eastern edge of the province is entirely bordered by the Indian Ocean (Figure 4.1). The province has a varied topography, with lowlands found along the Indian Ocean coast, plains in the midlands, and two mountainous ranges i.e. the Drakensberg and the Lebombo Mountains. The summer seasons of KZN are wet, hot and humid while the winters are mild. Rain falls throughout the year with a mean annual rainfall of 845 mm (Enviro-Info, 2001).

4.2 The demography of KZN

According to the census count of 2001 of South Africa, KZN has a total population of 9 426 017, with 5 016 927 females and 4 409 092 males, thus a male: female ratio of 1:1.14 (STATSSA, 2003). One of the reasons for the slight dominance of females, especially in the rural areas is the fact that a significant proportion of male adults seek employment outside their province (Mugero and Hoque, 2001). Overall, this population makes up 21% of the national populace, the largest provincial population in South Africa. The population growth in KZN over the period between the census of 2001 and the previous census of 1996 was almost 12%; when one considers that the provincial population count of census 1996 was 8 417 021 (STATSSA, 2004).

The population pyramids of KZN (Figures 4.2 and 4.3) give a description of the population's composition by number and gender in each age category (Census, 1998; Census, 2003). Although there was a population growth of 12% between 1996 and 2001, the general population profile has remained consistent to a large extent. Both population pyramids have a characteristically expansive age groups distribution pattern, in that young age groups represent a large portion of the population. The population pyramids are characteristic of populations with very large fertility rates and lower than average life expectancy (PRB, 2005). The collective age group of 15 - 34 year olds, which is by and large the reproductive age group, makes up 49% of both the 1996 and 2001 population pyramids of KwaZulu-Natal.

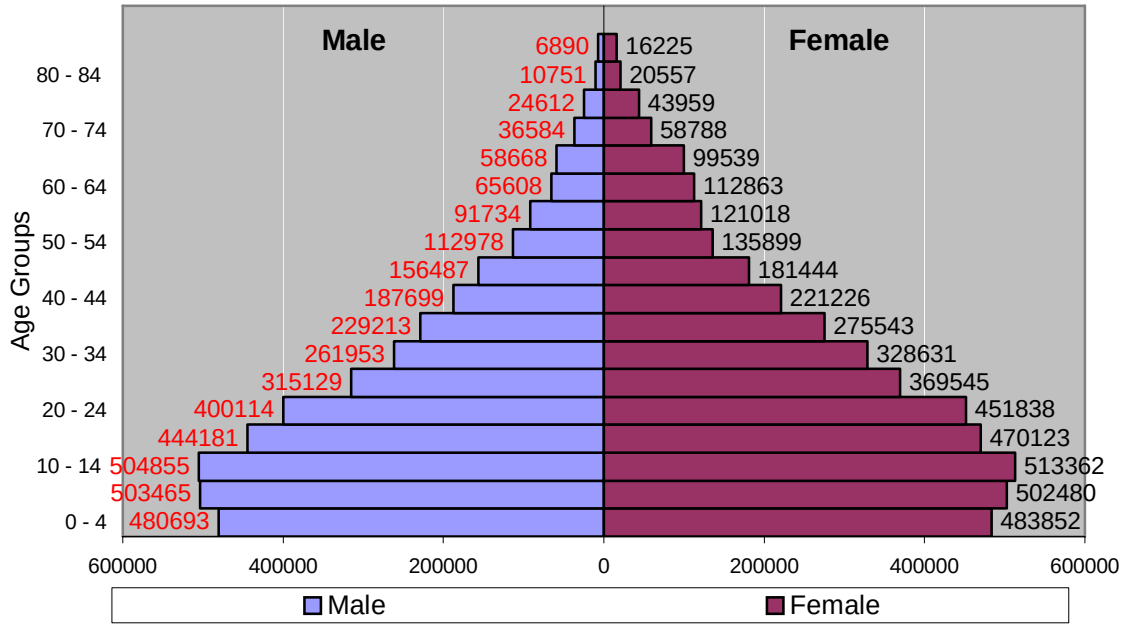


Figure 4.2: KZN population statistics as reported by Census 1996.

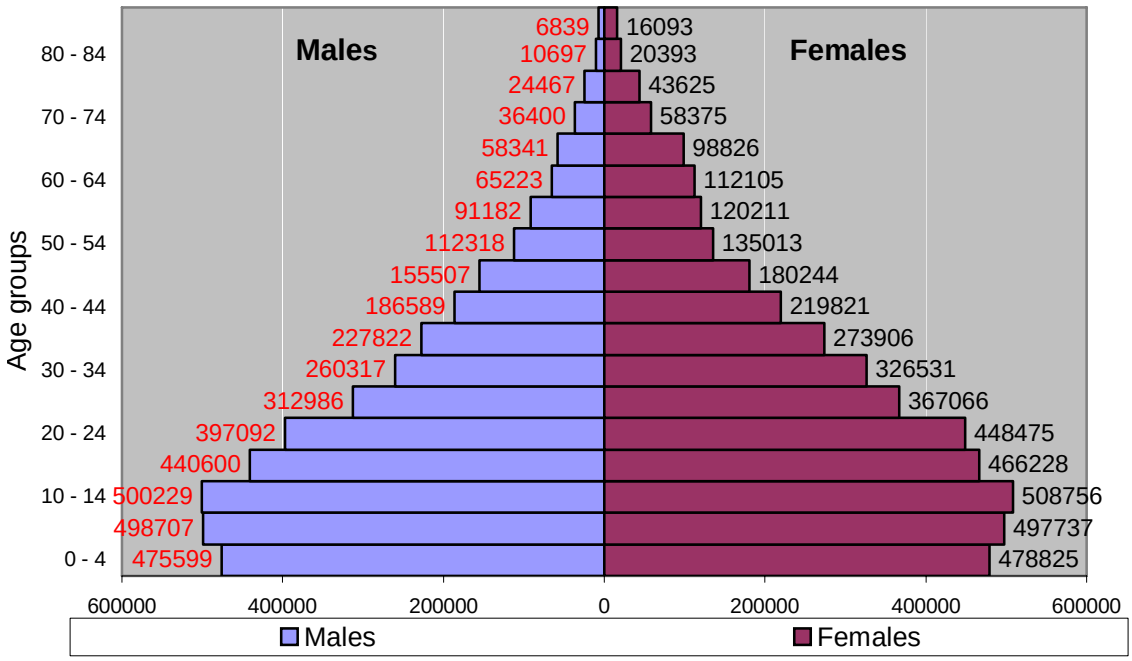


Figure 4.3: KZN population statistics as reported by Census 2001.

This accounts for the high reproductive rate in the province. The age-sex distributions of developing countries would typically display such a pattern (PRB, 2005). As it will

be seen later in Chapter 5, the age groups most affected by cholera are in the majority represented by the 5 - 34 years age range of which the reproductive age group is well representative.

4.3 The socio-economic profile of KwaZulu-Natal

The socio-economic variables used in this study together and the creation of the cholera database was based on information sourced from the South African census 1996 database, as explained in 3.3.3.2. Thus the socio-economic profile presented here reviews the situation in KZN as presented by both the 1996 and 2001 censuses. In 1996 at least 43% of the province's population lived in urban areas as opposed to more than 57% who live in non-urban areas (STATSSA 1998). The census 2001 did not present a comparison between the urban and non-urban population. Notwithstanding, it is probably more or less the same.

Several reports highlighted the fact that most people do not have access to clean water either because the infrastructure is non-existent or they cannot afford to pay for access for basic services (Ka-Min, 2000; Nhlapo-Hlope, 2001). Attention had also been drawn to the fact that in KwaZulu-Natal at least one million people do not have access to adequate sanitation, while the figure is around 18 million for the whole country (Sidley, 2001). A list of the basic socio-economic indicators is presented in table 4.1 as reported by the 1996 and 2001 national censuses, highlighting the developments in the delivery of basic services by 2001. According to this information, there has generally been a significant improvement in the sectors of education and housing. In particular, there was a major improvement in the situation of the homeless category; whereby it decreased by 186.9% in KZN, and by 221.7% nationally. This major decrease can be attributed to several factors. It is possible that the homeless people found opportunities of shelter in one of the three larger housing categories i.e. formal, informal or traditional. It could also be that the low-income national housing schemes undertaken by the government are addressing the housing issue positively. Improvement in the employment sector between 1996 and 2001 was marginal, standing at only 2%. While over the same period, unemployment increased by 33.8%. In the energy sector, the proportion of households affording the use of electricity and other hydrocarbon energy sources increased between 8-24.5%. At the same time,

there was an almost 50% increase in households reverting to using animal dung and other unspecified sources for their energy needs, reflecting a generally low economic status of such households. The water services sector had a decrease of 5.2% households with piped water in their dwelling, which is probably indicative of discontinuation of the service for economic reasons. The proportion of households with piped water inside their yard was the highest at 64.9%, probably because it is a cheaper option than having piped water inside a household. There was also a substantial increase of 38.5% households continuing to use public taps, which may not be surprising considering this is a free service to the public. In general there has been a decrease in houses using water from natural sources, especially the households using boreholes that had reduced by 25.8%. The reduction of households using dam/river/stream/spring water was relatively far less at 4.8% which is reflective of the corresponding improvements in the supply of piped water to the KZN communities. Despite these improvements, 49.3% of households had their water supply source(s) termed as "other" thus implying that they have no specific source of water supply. This may be an indirect reflection that the natural water bodies are still important resources to the livelihoods of some rural communities.

There was a substantial increase in the proportion of households with sanitation; even though some options were not necessarily safe like the bucket latrine. Needless to say, a major part of the 29% increase of households with flush or chemical toilets would be located in urban or peri-urban areas where people can afford such facilities. The increase in the number of pit latrines was the smallest at 7.6%. This is surprising considering that pit latrines are a cheaper sanitation option than the flush or chemical toilets and safer than the bucket latrine especially in rural settings. On the other hand, the largest increase in a sanitation option was the 34.6% of households using the bucket toilet. Even more interesting is that an increment of such a proportion was not reflected at the national level. The alarming thing is that the bucket toilet has been identified as unhygienic and environmentally undesirable by DWAF (2002a), thus a potential health hazard especially in areas where the municipal service of emptying the buckets is not regular.

Table 4.1: Comparing the socio-economic variables of Census 1996 and Census 2001 (KZN and South Africa).

	KZN - 1996	RSA -1996	KZN - 2001	RSA - 2001	Diff '96-01 - KZN	Diff '96-01 - RSA	% Change KZN	% Change RSA
Highest Level of Education	Persons	Persons	Persons	Persons	Persons	Persons	Persons	Persons
No Schooling	957,217	4,066,187	1,100,291	4,567,497	143,074	501,310	13.0	11.0
Some Primary	747,586	3,512,415	849,144	4,083,742	101,558	571,327	12.0	14.0
Complete Primary	278,435	1,571,774	287,070	1,623,467	8,635	51,693	3.0	3.2
Some Secondary	1,328,708	7,130,121	1,447,674	7,846,125	118,966	716,004	8.2	9.1
Grade 12 / Standard 10	665,303	3,458,434	995,616	5,200,602	330,313	1,742,168	33.2	33.5
Higher/Tertiary Education	200,819	1,294,720	348,744	2,151,336	147,925	856,616	42.4	39.8
Unspecified/Other	217,428	1,112,568	N/A	N/A	N/A	N/A	N/A	N/A
Labour Market Status	Persons	Persons	Persons	Persons	Persons	Persons	Persons	Persons
Employed	1,570,573	9,113,847	1,602,270	9,583,762	31,697	469,915	2.0	4.9
Unemployed	1,008,944	4,671,647	1,523,214	6,824,075	514,270	2,152,428	33.8	31.5
Not Economically Active	N/A	N/A	2,629,796	12,019,290	N/A	N/A	N/A	N/A
Total Labour Force	N/A	N/A	3,125,484	16,407,837	N/A	N/A	N/A	N/A
Type of Dwelling	Households	Households	Households	Households	Households	Households	Households	Households
Formal	918,793	5,834,819	1,271,795	7,680,421	353,002	1,845,602	27.8	24.0
Informal (Incl. Caravan/Tents)*	188,301	1,470,141	225,825	1,836,231	37,524	366,090	16.6	19.9
Traditional	532,046	1,644,388	581,036	1,654,787	48,990	10,399	8.4	0.6
Other (Homeless & unspecified)*	21,793	110,223	7,595	34,266	14,198	75,957	-186.9	-221.7
Energy Source for Cooking	Households	Households	Households	Households	Households	Households	Households	Households
Electricity	760,611	4,265,305	1,007,737	5,761,354	247,126	1,496,049	24.5	26.0
Gas	52,691	286,657	63,917	284,295	11,226	2,362	17.6	-0.8
Paraffin	296,017	1,943,862	374,356	2,394,919	78,339	451,057	20.9	18.8
Wood	490,122	2,073,219	562,970	2,292,674	72,848	219,455	12.9	9.6
Coal	38,877	320,830	42,267	310,059	3,390	10,771	8.0	-3.5
Animal dung	10,533	106,068	20,736	110,969	10,203	4,901	49.2	4.4
Solar	N/A	N/A	6,146	24,225	N/A	N/A	N/A	N/A
Other	12,085	63,629	8,122	27,210	3,963	36,419	48.8	-133.8
Supply	Households	Households	Households	Households	Households	Households	Households	Households
Piped Water to the Dwelling	650,677	3,976,855	618,267	3,617,603	32,410	359,252	-5.2	-9.9
Piped Water inside yard	145,237	1,491,228	413,535	3,253,861	268,298	1,762,633	64.9	54.2

Table 4.1: (Cont'd).

Piped Water to Community Stand (Less or more than 200m) (public tap)*	304,502	1,765,945	494,966	2,594,904	190,464	828,959	38.5	31.9
Borehole (Well)*	110,755	441,884	88,065	270,882	22,690	171,002	-25.8	-63.1
Rain-water Tank	N/A	N/A	15,787	67,680	N/A	N/A	N/A	N/A
Dam/ river/ stream/ spring	402,822	1,116,484	384,448	1,050,055	18,374	66,429	-4.8	-6.3
Water vendor	20,059	111,204	18,126	83,634	1,933	27,570	-10.7	-33.0
Other	26,882	155,970	53,056	267,086	26,174	111,116	49.3	41.6
Toilet Facility	Households	Households	Households	Households	Households	Households	Households	Households
Flush toilet or chemical toilet	693,130	4,552,854	978,016	6,031,385	284,886	1,478,531	29.1	24.5
Pit latrine with/without ventilation	690,560	2,919,594	747,091	3,193,433	56,531	273,839	7.6	8.6
Bucket latrine	15,713	420,185	24,025	457,376	8,312	37,191	34.6	8.1
None	250,956	1,118,132	337,119	1,523,512	86,163	405,380	25.6	26.6
Unspecified/Other	10,575	48,807	N/A	N/A	N/A	N/A	N/A	N/A
Refuse Removal	Households	Households	Households	Households	Households	Households	Households	Households
Removed by municipality weekly	696,395	4,641,115	1,026,046	6,210,215	329,651	1,569,100	32.1	25.3
Removed by municipality less often	20,148	200,477	21,281	172,027	1,133	28,450	5.3	-16.5
Communal refuse dump	47,852	287,199	16,934	195,679	30,918	91,520	-182.6	-46.8
Own refuse dump	672,398	2,905,586	806,028	3,655,043	133,630	749,457	16.6	20.5
No rubbish disposal	186,567	862,726	215,962	972,741	29,395	110,015	13.6	11.3
Unspecified/Other	37,574	162,469	N/A	N/A	N/A	N/A	N/A	N/A

Source: Stats in brief. Ten years of democratic governance. 2004. Statistics South Africa. Pretoria.

By 2001, households with a regular (weekly) refuse removal service by the municipality had increased by 32.1% and those receiving a similar but irregular municipal service, increased by 5.3%. Households that depend on communal refuse dumps had decreased by 182.6%, probably because there was a decrease in the availability of such facilities within the communities of KZN. There was still an increment of 16.6% of households who used and managed their own refuse, indicating the lack of service from the municipalities involved. There was also a 13.6% increase of households that had no organised form of rubbish disposal. These households most certainly contribute significantly to the environmental pollution of their localities.

4.4 History of cholera in KwaZulu-Natal

Cholera has long been recognised as a disease of poor sanitation and poor living conditions. Previous epidemics in South Africa have shown cholera to be most prevalent in fairly densely populated rural communities of low social economic status (Isaäcson, 1986). After several years of surveillance, it was established that cholera in southern Africa affected socio-economically deprived communities in densely populated, rural, tropical and subtropical areas; with the peak incidence occurring after the onset of the main summer rains (Kustner and du Plessis 1991). In South Africa, KZN is one of the poorest provinces, with over nine million residents, the majority of whom live in crowded, rural and underdeveloped conditions that favour the spread of the disease (Laskow, 2001). In addition, many people in Kwa-Zulu-Natal still rely on river water for cooking, drinking and washing practices which have been demonstrated to be positively associated with an increased risk for transmission of cholera (Kustner *et al.*, 1981; Shapiro *et al.*, 1999).

The DOH of South Africa compiled a record of cholera cases reported in South Africa from the year 1980 to 2000 (Table 3.2). It is interesting to note that, at the beginning of the DOH monitoring and surveillance exercise, KZN recorded only one case in 1980. This state of affairs changed from 1982, when KZN was foremost in reporting cholera (DOH-Statistical Notes, 2000a). The escalation of cholera in KZN was marked during the period November 1981 to January 1982 with the outbreak of cholera in the Umvoti Mission Reserve situated 75 km north of Durban. A total of 154 cases of cholera were reported, which at the time, showed a strong association

between consumption of impure water, socio-economic conditions and the incidence of cholera (Sitas, 1986). The study suggested that the typical pattern of spread implied that the disease may not have been exclusively waterborne, and that other mechanisms like person-to-person transmission may have had a role in the spread of the disease.

Table 4.2: Cholera cases reported over the past 20 years.

PROVINCE → YEAR ↓	**EC**	**FS**	**GA**	**KZN**	**MP**	**NP**	**NW**	**WC**	**X X**	**TOTAL**
1980	-	-	68	1	1238	96	15	-	-	1418
1981	-	22	205	943	1275	2458	633	-	-	5536
1982	125	1	140	12263	462	858	51	-	-	13900
1983	30	15	156	6427	142	107	2	-	-	6879
1984	7	1	12	1663	1	1	-	-	-	1685
1985	-	-	-	699	1	1	-	-	-	701
1986-1990	-	-	6	330	-	-	-	1	-	337
1991-1 995	1	-	9	89	15	-	3	-	2	119
1996-2000	1	-	3	37	21	-	4	-	4	70
SA TOTAL	**164**	**39**	**599**	**22452**	**3155**	**3521**	**708**	**1**	**6**	**30645**

EC = Eastern Cape FS = Free State GA = Gauteng KZN = KwaZulu-Natal
MP = Mpumalanga NP = Northern Province NW = North West WC = Western Cape
XX = Cases acquired outside South Africa - = No reported case(s)

Source: Department of Health, Statistical Notes, 2(14) March 2000.

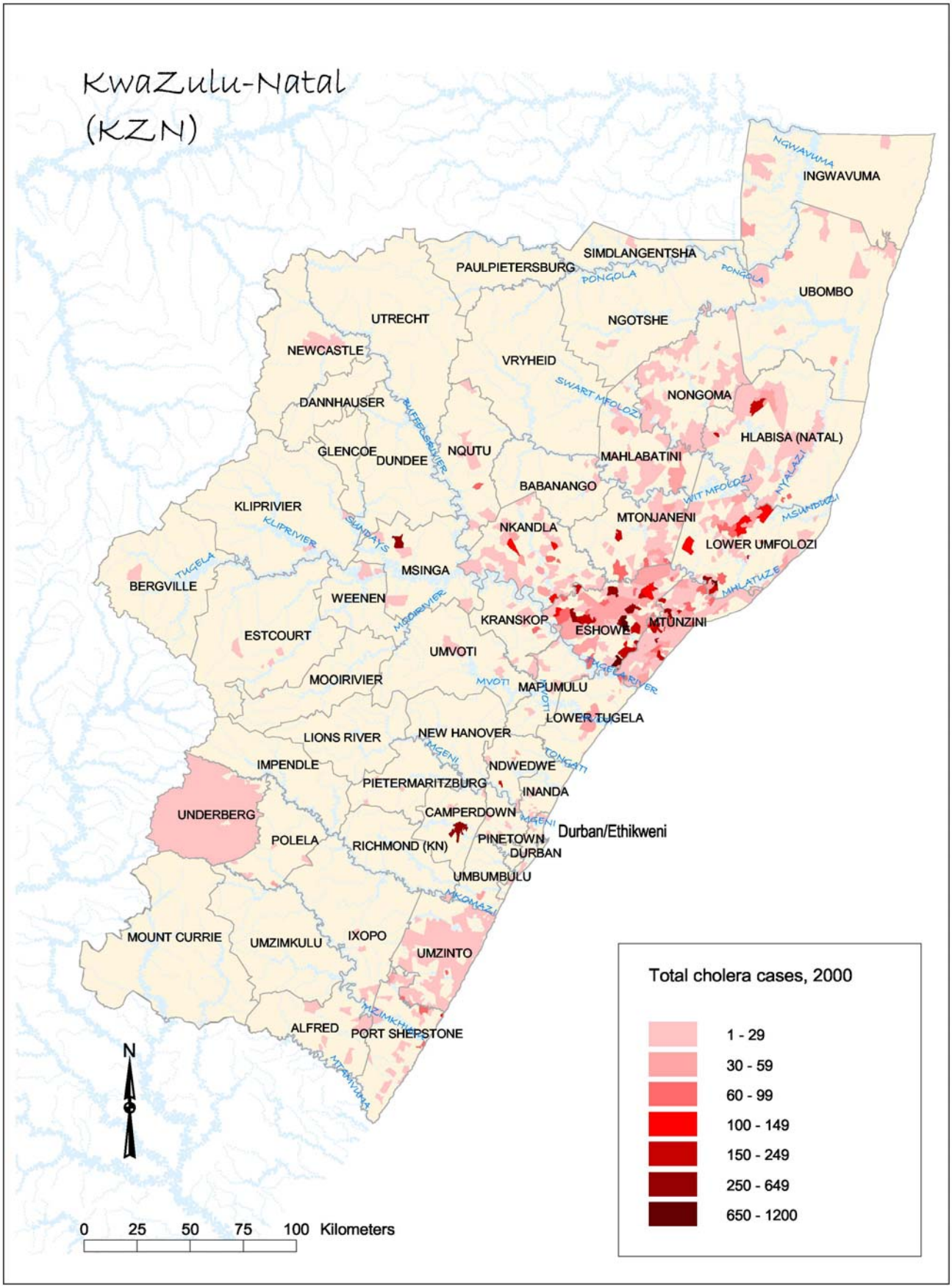
As from 1981-1985, KZN reported 21 995 (76.6%) cholera cases from a national total of 28 701 cholera cases within the same period (Table3.2). Thereafter, from 1986 up to mid 2000, there were random reports of cholera cases, with KZN reporting 456 cases, accounting for 87% of the national total of 526 (DOH-Statistical Notes, 2000a). Since then, KZN regularly reported cholera cases up to the start of the new epidemic in August 2000. The trend was probably indicative of cholera having become endemic in KZN, suggesting that *V. cholerae* strains capable of causing epidemics are resident

microorganism within the environs of KZN. Just before the 2000 cholera epidemic, Simpson & Charles (2000) released the outcome of a study they had conducted covering the period between July 1998 – February 2000, where they monitored effluent discharge from rural hospitals in KZN. In 1999, two hospitals tested positive for cholera organisms in their raw sewage. This was seen to pose a grave health risk to the communities that were using water from springs in close proximity to the hospital.

4.5 The cholera epidemic of 2000-2004 in KwaZulu-Natal

South Africa experienced a new wave of cholera that swept the eastern coast of South Africa starting in mid August 2000. The causative organism was identified as *Vibrio cholerae* El Tor (Mugero and Hoque, 2001). The outbreak was predicted by Keddy & Koornhof (1998), when they foresaw that an ongoing cholera epidemic in Mozambique would possibly re-emerge in South Africa. Before then, cholera had last posed as a public health crisis between 1980-1985 (DOH-Statistical Notes, 2000a). The start of the outbreak was attributed to an incident where a local authority stopped supplying free water and introduced a charge to the very poor people living in an informal settlement near the town of Empangeni (Hemson, 2000; Sidley, 2001, Cottle and Deedat 2002). Subsequently, cholera had a firm grip on the rural parts of Kwa-Zulu Natal, as it developed into the most serious epidemic yet experienced in KZN with cases still continuing to be reported well into the year 2004.

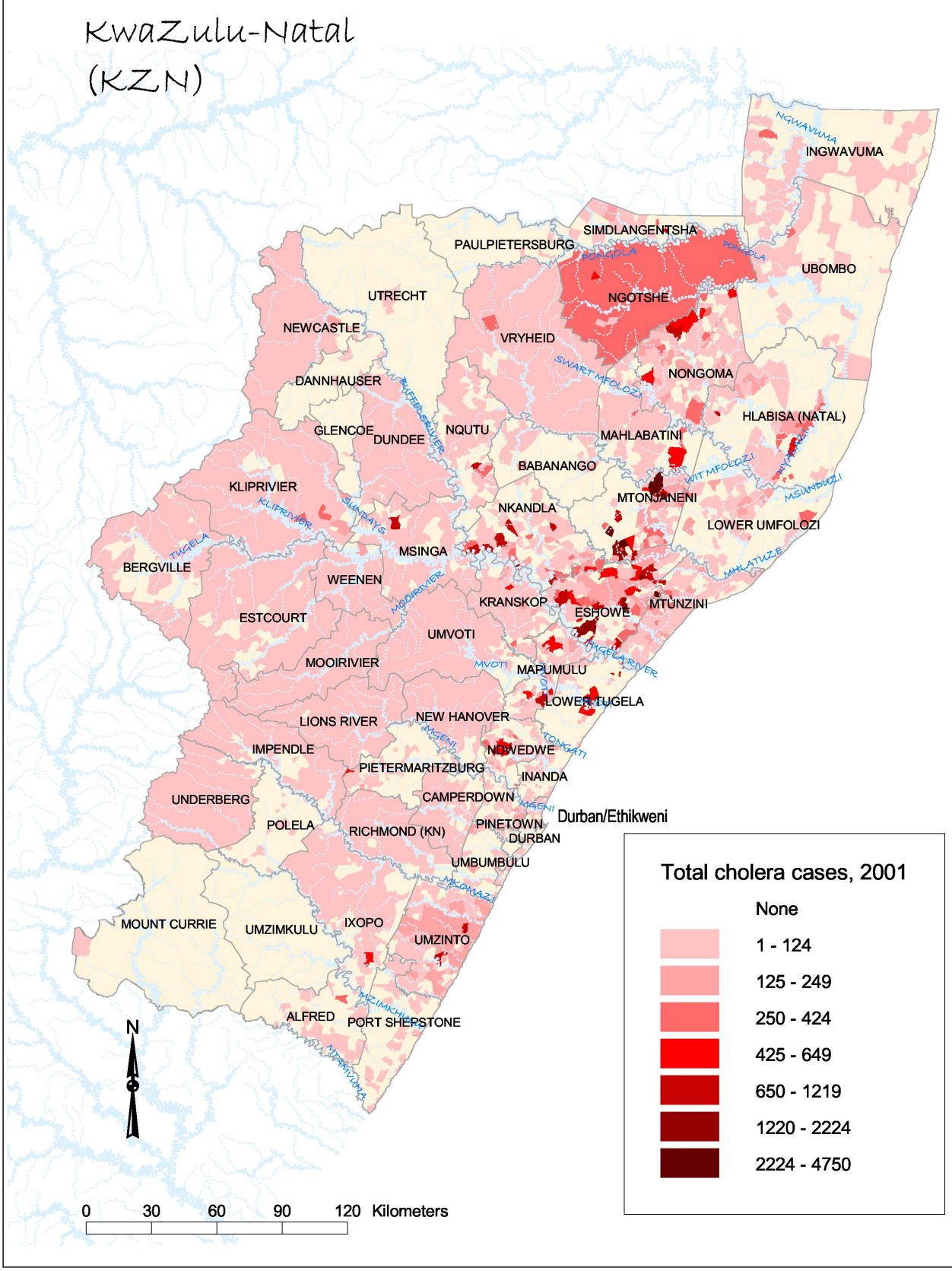
The index case was notified on 14th August, a patient from Empangeni, who had attended a funeral gathering the previous week (DOH, 2000-b). As cholera swept through KZN, it became obvious that most of those who had fallen ill lived in rural areas with little or no running water or adequate sanitation, yet again supporting previous observations that in southern Africa, cholera affects socio-economically deprived communities in densely populated rural area with tropical and subtropical climates (Kustner *et al.*, 1981; Isaäcson 1986; Sitas 1986). The multitude of new cholera cases being reported on a daily basis since the start of the epidemic in August 2000 developed into a national emergency. Cholera became the standard term used to describe any case of diarrhoea in the panic stricken province (McDonald, 2002).



Map 1: Occurence of Cholera in KZN in 2000

The annual cholera incidence trends in GIS maps 1-4 portray the distribution of cholera between August'00 and December'03 as well as the most affected areas. Map 1 highlights the spatial pattern of the spread of cholera in the year 2000. The incidence of cholera in the MDs (Magisterial Districts) of Eshowe, Mtunzini and Lower Umfolozi were the highest in the year 2000, with areas reporting up to 1 200 cases (Map 1). The zone of cholera cases within the afore-mentioned MDs appear to be confined within a region bordered by the rivers Tugela and Mhlatuze, making it the main disease foci. Notwithstanding, there were more cholera cases reported along the localities along the coastal border of the province of KZN than to the interior. The rest of the cholera cases reported from the other MDs within the same year were relatively lower in the range of 2-29 cases. Predictably, with the movement of people within the province, especially towards the end of the year 2000, which is also a holiday season, *V. cholerae* rapidly spread to other areas (Reeves and Boshielo, 2001; Mahmood, 2001).

The national and the provincial governments both allocated resources for the treatment and prevention of the disease (Mugero and Huq, 2001). Despite prompt medical intervention, health education and media campaigns, cholera spread to almost every corner of DC28, which was the epicentre of the outbreak in a matter of weeks. As in most cholera epidemics, there were several early fatalities, possibly due to the general lack of immunity within the communities against the infection, as well as because of the unprepared-ness of the health institutions to deal with the sudden overwhelming number of cholera patients. This situation prompted two important responses. Most important us that affected individuals began to seek help quickly when they developed severe diarrhoea; and the authorities reciprocated by establishing a network of field re-hydration centres within, or close to the affected communities to reduce the delay between development of symptoms and receipt of treatment (Mugero and Hoque, 2001; Reeves and Boshielo, 2001). By 2001, the spread of cholera in KZN was extensive, spreading to cover almost the entire province (Map 2). The major peak of the cholera epidemic in KZN was experienced in 2001. At this point, the health institutions of some of the worst affected areas were receiving reports of over 1 000 cholera cases per day (Nhlapo-Hlope, 2001; Kriner, 2002).

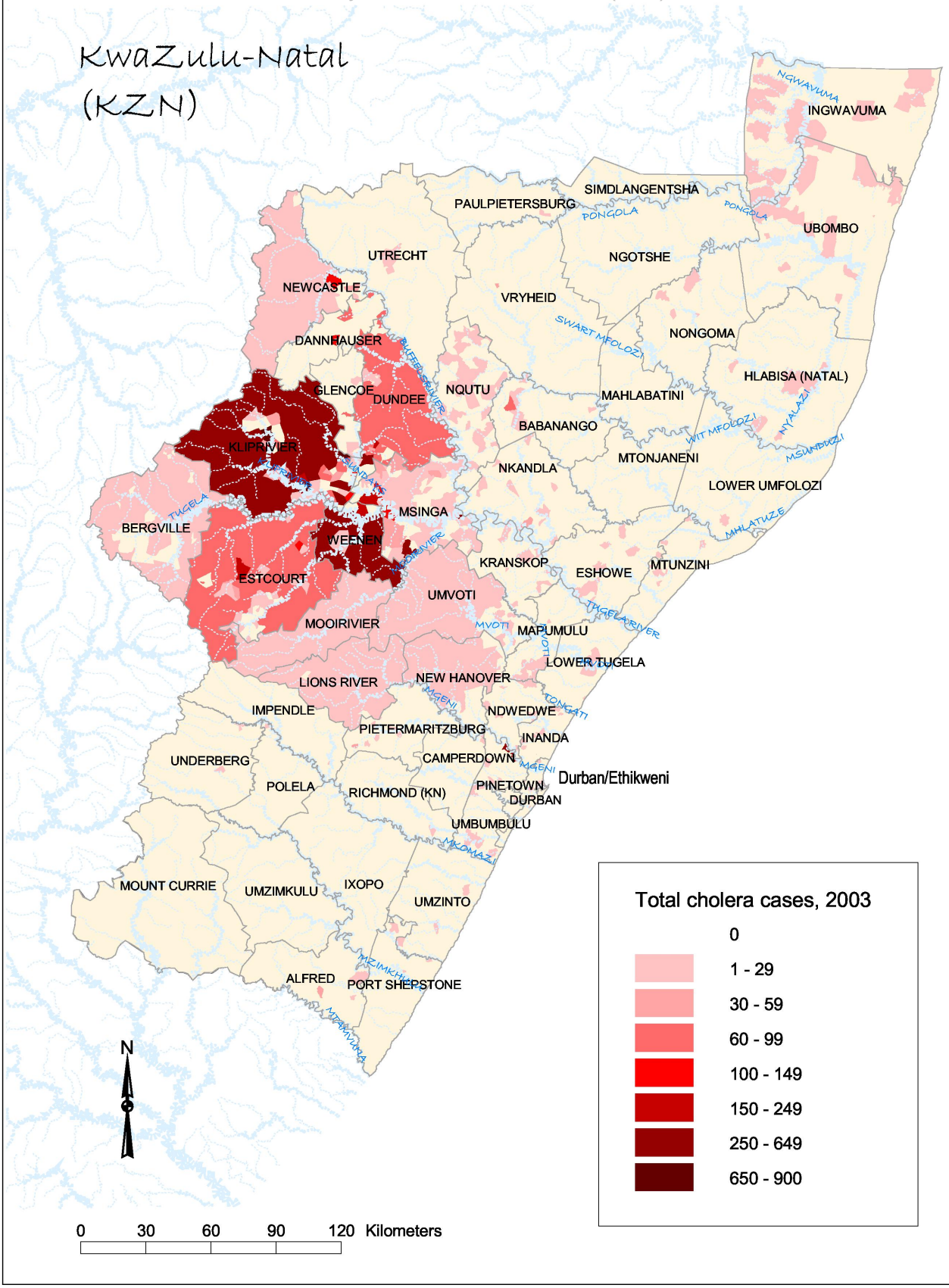


Map 2: Occurence of Cholera in KZN in 2001

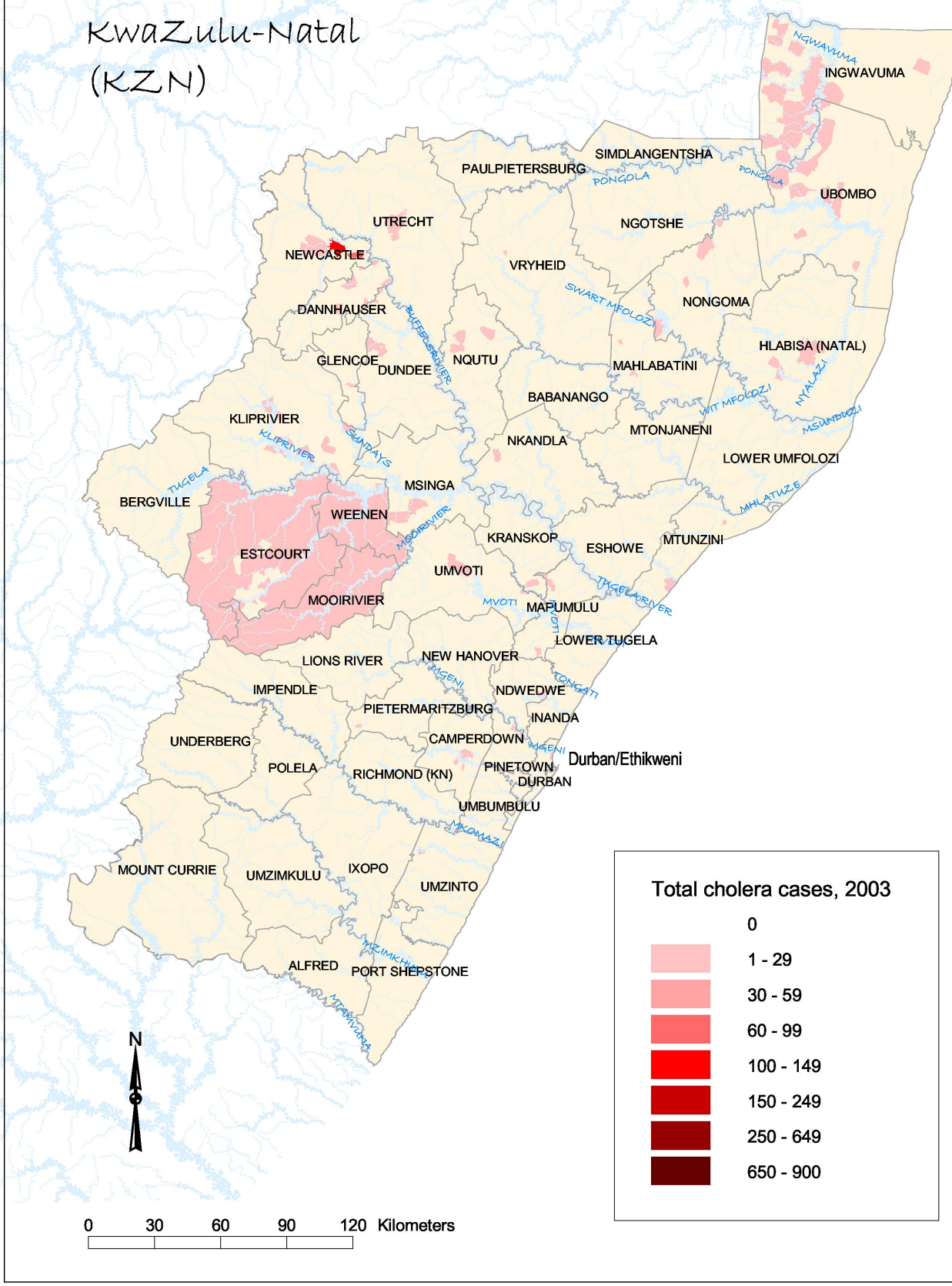
At a public level, there was media fury with local and international press speculating on the factors that brought about the epidemic. In the forefront was the consensus that introduction of water charges was one of the main reasons. Such that people who were too poor to pay their bills consequently had their water supply cut, forcing them to use polluted water from the rivers that were suspected to have harboured the pathogens responsible for the outbreak (Ka-Min, 2000; Pauw, 2003). This opinion was supported by labour unions who felt that the Growth Employment and Redistribution (GEAR) strategy of cost recovery for social services that required people to pay for previously free clean water had left the poor no choice but to opt for surface water (Laskow, 2001). The theory was strengthened with the news that the Department of Water Affairs and Forestry had acknowledged the possibility of this link (Weissman, 2000).

On a broader level, government and health officials systematically tackled the epidemic with mandatory reporting and treatment of the disease. This involved setting up of temporary health facilities, providing adequate supplies to the existing hospitals, clinics and re-hydration centres, as well the establishment of clean drinking water sources. Immediate measures especially within the most affected, ill serviced areas included provision of water tanks serviced by tanker trucks that delivered chlorinated water (Nhlapo-Hlope, 2001; Sidley, 2001). This action discouraged the use of potentially contaminated traditional water sourcing points and greatly reduced the burden of those whose job it is to fetch water for their families' daily domestic needs. Subsequently though, people became dependent on the tanker water supplies and the withdrawing of the costly service to resort to other strategies met with resistance from the community and sparked much debate amongst planners and decision makers (McDonald, 2002).

Mass education and awareness campaigns made use of radio, television, posters and pamphlets in an attempt to demystify the scourge and help curb the spread (Mugero and Hoque, 2001; Reeves and Boshielo, 2001). High on the agenda of educational campaigns was to raise the level of awareness of the communities, particularly on how to protect themselves against cholera (Reeves and Boshielo, 2001). The main focus was to urge people to either boil or add bleach to water sourced from natural water sources like rivers, streams and dams (Mugero and Hoque, 2001; Sidley, 2001). There was also inter-sectarian collaboration between the Department of Health and



Map 3: Occurence of Cholera in KZN in 2002



Map 4: Occurence of Cholera in KZN in 2003

other government departments, professional bodies, non-governmental organisations (NGOs) and members of the community to contain the spread of cholera (Mugero and Huq, 2001). The World Health Organisation (WHO) was also requested for assistance in tackling the epidemic (Laskow, 2001; Mahmood, 2001). The organisation responded by assigning an epidemiologist to the cholera stricken province on an advisory capacity to the DOH. The WHO team reported that the successful case management of cholera casualties accounted for the "exceptionally low" death rate, estimated at 0.29% (Morris, 2001; Kriner 2001).

In 2002, the disease foci shifted to the west side of the province (Map 3). In this period, high numbers of cholera cases (650-900) were reported in the Uthukela district (DC23), especially the MDs of Klipriver, Weenen, Dundee and Escourt respectively (DOH-KZN, 2002). A sharp contrast from the other neighbouring communities that reported fewer cases of between 1-29. By the year 2003, cases of between 1-29 persisted in the Uthukela district (DC23) in the MDs of Mooiriver, Weenen and Escourt (Map 4). By this time though, cholera had by and large waned throughout KZN but not completely disappeared. A case in point is the cholera foci in the community of Madadeni, which is adjacent to Newcastle. The same foci is also visible in 2002 (Map 3). Madadeni is an informal township just outside Newcastle. In the 1996 Census, the population of Newcastle was approximately 44 000, while that of Madedeni was nearly 2.5 times more at approximately 110,000 individuals. This scenario implies that low standards of living go hand in hand with high infection rates.

On a different level, though a shortage of clean water and adequate sanitation have carried the banner of blame for the epidemic, HIV has also been implicated as one of the underlying causes of the persistence of cholera in KwaZulu-Natal, when one takes into account that the province has the highest HIV infection rate in the country (UN-IRIN, 2001). This was supported by the findings that those badly affected by cholera are mostly patients with chronic ailments, elderly individuals, and those with clinical evidence of a compromised immune system. (McDonald, 2002). HIV/AIDS data for the general population of KZN was not available to the study to conclusively demonstrate a link between HIV and the cholera epidemic. Thus, the assumption made during the study was that HIV was affecting the KZN communities evenly.

By March 2004, the Cholera Database continuing the official statistics of cholera cases in Kwa-Zulu-Natal, for the period August 2000 to February 2004, stood at 158,895 cases (KZN-DOH, 2004). The fatalities associated with these cholera statistics were 575 deaths, (a case fatality rate [CFR] of 0.36%) which to date is the lowest compared to previous South African epidemics. The exploration of the Cholera database whether independently or in association with other databases related to demography, socio-economic and climatic variables in KZN are explained at length in Chapter 5. The results in Chapter 5 are essentially outputs from the spreadsheet manipulation of the Attribute Database, presented in basic formats such as tables, charts and different types of graphs. The following chapter highlights the general trend of the 2000-2004 cholera epidemic in KZN, thus giving a holistic picture of the epidemic in relation to the demographic picture of KZN and within the administrative demarcations of KZN.