COMMUNICABLE DISEASE CONTROL STRATEGY FOR MALTA

2013

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ACKNOWLEGEMENTS

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SUMMARY

Communicable diseases remain one of the highest priorities for public health both nationally and internationally. Effective surveillance is the cornerstone to the prevention and control of communicable diseases. Surveillance is carried out by the Infectious Disease Prevention and Control Unit within the Health Promotion and Disease Prevention Directorate and provides a mechanism for the co-ordination of national communicable disease surveillance activities in co operation with the clinical and laboratory services and other departments and entities. There is however, a need to strengthen the coordination and planning of surveillance activities at the national level, and to enhance the strategic plan for responding to the priority public health problems identified.

This revised National Communicable Diseases Control Strategy is an initiative of the Ministry for Health. The strategy sets out to: describe the scope and nature of the threat posed by infectious diseases to the health of the population of Malta and establish the priorities for action to combat the present as well as possible future threat posed by infectious diseases. In the development of this strategy, the experience and opinion of various experts were incorporated. This strongly supports the need for a broad based approach to these threats.

The Strategy emphasises the need for the co-ordination of national surveillance for the planning and prioritisation of interventions, the optimal use of laboratory science in communicable disease management and the availability of an effective response capacity for outbreaks of national significance.

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INTRODUCTION

Communicable diseases are those illnesses that are caused by specific infectious agents or their toxic products. Disease may occur as a result of transmission of an infectious agent or its products directly from an infected source to a susceptible host, or indirectly through an intermediate host or vector.

During the 1960s and 1970s it was widely held that it would be possible to eliminate the communicable disease burden in industrialised countries. In the days following the World War II, it was believed that humans were winning the centuries- long war against infectious microbes. Life-threatening bacterial diseases, such as tuberculosis and typhoid fever could be treated by antibiotics. Dreaded diseases of childhood such as polio, whooping cough, and diphtheria could be conquered by vaccination. Coupled with the earlier improvements in urban sanitation and water quality, vaccines and antibiotics dramatically lowered the incidence of infectious diseases. Thus it became possible to imagine a world in which infectious pathogens would no longer prey upon humanity.

This complacency on the threat of communicable diseases has led to less priority for communicable disease surveillance systems. This belief has been challenged over the past two decades with the re-emergence of diseases that were once thought to be controlled including malaria, cholera, and sleeping sickness and the emergence of new diseases such as HIV/AIDS, hepatitis C, and dengue haemorrhagic fever. Apart from this, there are continuing threats of large epidemics with widespread mortality like the 'Spanish flu' epidemic in 1918-1919 which killed an estimated 40 million people worldwide and other threats such as the growing resistance to antimicrobial drugs.

Infectious diseases today cause 63% of all childhood deaths and 48% of premature deaths. Indeed, communicable diseases remain a global problem in a constant state of flux, with many factors influencing the risk to human health from infectious disease, including global travel and trade, the impact of technology, environmental change, human behaviour and microbial adaptation.

All communicable diseases are potentially preventable in some way, either by eliminating the source, addressing environmental factors (such as hygiene and overcrowding) or from preventative measures, such as vaccination.

Control of communicable diseases is a major public issue that the Government has a responsibility to address. Surveillance has been defined as the continuing scrutiny of all aspects of the occurrence and spread of a disease that are pertinent to effective control. For this, systematic collection, analysis, interpretation and dissemination of health data are essential. This includes collecting information about clinical diagnoses, laboratory diagnoses and mortality, as well as other relevant information needed to detect and track diseases in terms of person, place and time. Surveillance systems must detect new communicable diseases as well as recognize and track diseases that currently are, or have the potential to become, of major public health importance.

Elimination, prevention and control of communicable diseases will bring great social and financial benefits, both in terms of health service provision and through increasing productivity. The health of the nation is dependent on the effectiveness of its public health programmes as well as the effectiveness of health service delivery.

HUMAN IMMUNODEFICIENCY VIRUS INFECTION / ACQUIRED IMMUNODEFICIENCY SYNDROME (HIV/AIDS)

The World Health Organisation (WHO) estimates that there are about 34 million cases infected with AIDS/HIV worldwide and that in 2011 there were 1.7 million AIDS deaths globally (UNAIDS global report, 2013). The overall growth of the epidemic has stabilised in recent years. The annual number of new HIV infections has steadily decreased and due to significant increase in people receiving anti-retroviral treatment (ART), the number of AIDS related deaths has also decreased.

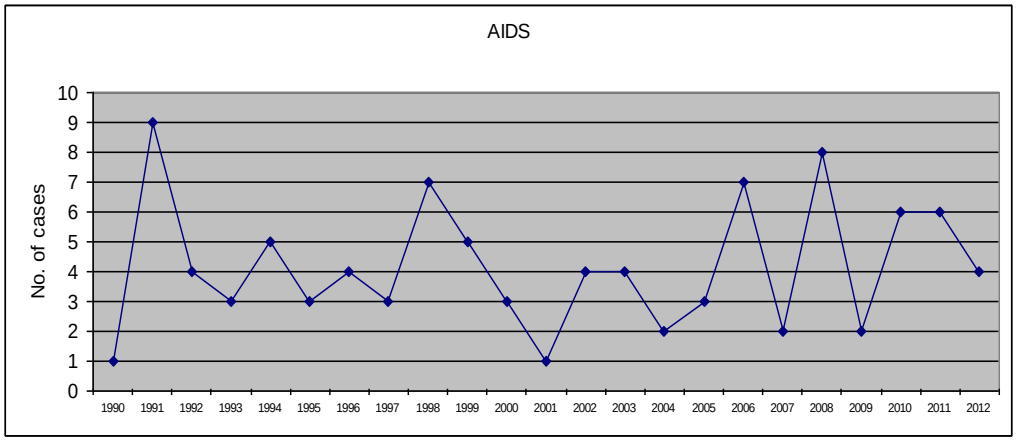
Between 1986 and 2012, there were 94 cases of AIDS in Malta, of which 59 (62.7%) subsequently died from the infection (Table 1). This includes cases in Maltese and non Maltese residents. The incidence rate is slowly decreasing since a significant number of cases in the beginning of the epidemic were haemophiliacs who had received contaminated blood products. Screening of blood and products is now a routine practice and hence there have been no further cases of AIDS associated with blood transfusions. Also due to regular follow up of HIV cases and the increase in the number of people on ART, the number of deaths from AIDS has decreased.

Table 1 Number of notified cases and deaths due to AIDS, Malta, in Maltese residents 1986 – 2012

Year	**Notifications**	**Deaths**	Year	**Notifications**	**Deaths**
1986	5	4	2002	4	2
1987	2	2	2003	2	1
1988	7	4	2004	1	1
1989	0	1	2005	3	2
1990	1	2	2006	6	4
1991	7	3	2007	2	0
1992	4	5	2008	8	1
1993	3	3	2009	2	0
1994	5	4	2010	1	0
1995	3	1	2011	1	0
1996	4	8	2012	0	0
1997	2	2			
1998	4	3			
1999	1	1			
2000	3	2			
2001	0	0			

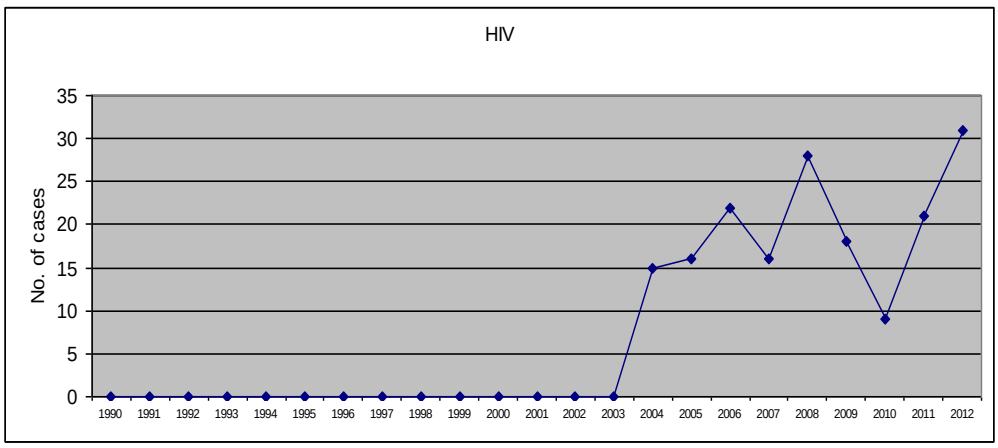
In 2010 there was a change in the definition of a Maltese resident, from NSO (National Office of Statistics) where a Maltese resident was defined as a person who had been living in Malta for a period of at least 12 months. This includes refugees but not irregular migrants. This has an impact on the number of notified cases as the definition changed and hence the classification.

Figure 1: Number of notified cases of AIDS, Malta, 1990-2012 (resident and non resident cases).



Since 2004 there has been an increase in the number of foreign nationals, including irregular migrants, who are diagnosed with HIV (Figure. 2)

Figure 2: Number of notified cases of HIV, Malta, 1990-2012



To date there are 216 known notified cases of HIV. A person with HIV infection can appear perfectly healthy for many years following exposure to the virus and during this time can infect other people. The principal ways in which HIV can be transmitted are through sexual intercourse with an infected person without a condom, sharing of drug injecting equipment and from an HIV-infected mother to her child around the time of birth. In Malta the main mode of transmission is sexual, and an increase in heterosexual transmission had been noted over recent years, which was more pronounced that the increase in transmission between men who have sex with men (MSM).

Table 2: Notified cases of AIDS by transmission category, Malta 1985-2012

Transmission category	**Persons**
Homo/Bisexual men	38
Haemophiliacs/ Coagulation disorders	14
Heterosexual contact	23
Homo/Bisexual Contact	1
Mother to child (imported)	1
Injecting drug users	0
Other/ Undetermined	5
Total	82

Issues to be considered in AIDS/HIV are:

- Many persons do not come for testing so the burden of illness may be bigger than what we estimate and also these infected persons have not been counselled and hence will continue to spread the disease. One should overcome prejudice through education to promote voluntary counselling and testing for HIV infection.

- From an HIV knowledge and behaviour survey of young Maltese in a local nightclub carried out in 1994, it was found that despite 90% of those questioned knowing that it was possible to contract HIV through unprotected sex, 36% of the sexually active men questioned never used a condom. (Fowler C, 1994) Health promotional campaigns need to take in account behavioural messages. The GU clinic Annual report 2013 states that condom use remains poor in patients attending this clinic with 70% stating that they never use a condom.

- There is currently neither a cure for HIV infection nor a vaccine that can protect against it. Treatment with anti-HIV drugs is allowing people with HIV to live longer, healthier lives and has reduced the number of deaths from HIV infection. Coupled with improved life expectancy, this means that the number of people living with HIV infection is growing.

- During 2013, there were 3 notified cases of HIV amongst Maltese residents which were associated with intravenous drug sharing and this need to be given priority.

- We need continued impetus to avoid mother-to-child transmission. Presently all women attending antenatal clinics are offered HIV testing. However, there may be women who may refuse testing or others who might present late in pregnancy or even during delivery. Therefore it is important to continue emphasising the importance of HIV screening in all pregnant women.

Acute viral encephalitis

Viral encephalitis is an inflammation of the brain caused by any one of a number of viruses. Infants and elderly people are particularly at risk of severe illness. Arboviruses (viruses transmitted by insect bites) are amongst the most common causes of viral encephalitis. These include Japanese encephalitis and tick-borne encephalitis viruses. Over the years only a few cases per year (up to 2 cases) were notified. In Malta, the last reported case was in 2007.

Antimicrobial resistance

The threat of antimicrobial resistance has been identified as one of the major challenges facing public health by numerous organisations and scientific societies including the WHO (WHO, 2012). The challenge of the 'Microbial Threat' has also been recognised by the European Union (EC, 2011). Indeed, antibiotic resistance has become one of the most pressing challenges in modern health care and has significant repercussions on both the patient as well as the healthcare system. Antibiotic resistance also has a major impact on health economics, especially hospitals. Patients with resistant healthcare-acquired infections need to stay longer than originally planned and often require second and third line antibiotics for treatment, which invariably come at a much higher cost. (Borg M, 2012)

The national strategy to address the problem of antimicrobial resistance is based on the three key elements of

- Surveillance: to provide the information base for action
- Prudent antibiotic use: to restrain against a rapid emergence of resistance. Antibiotic use remains one of the most important drivers causing antimicrobial resistance, especially in the community. Judicious use of antibiotics has two main cornerstones:
    - in the first instance antibiotics should only be used for bacterial infections
    - the other major driver of resistance is used of wide spectrum antibiotics
- Infection control to generally limit the spread of infection, particularly antimicrobial resistant cases, thus reducing the need for antibiotics

Resistance in local community infections is reaching worrying levels and has impacted on the development of resistance in ambulatory care. Most perturbing are the increasing number of cases of methycillin resistant Staphylococcus aureus

(MRSA) in the community as well as resistant *Enterococcus Coli (E.coli)* which has increased to disturbing levels. In the case of community MRSA, carriage rate amongst healthy individuals who have never required hospital treatment has been found to be more than 8%. It is one of the highest recorded levels in the world. Gram negative bacteria, especially *E.coli*, are also showing increasing resistance to beta-lactams as well as ciprofloxacin. It is however encouraging that the most important community pathogen, *Streptococcus pneumoniae*, remains relatively sensitive to penicillin. We are literally at a cross road. Nevertheless we have not yet reached a situation where resistance cannot be tackled or even possibly reversed. This, however, requires a change in habits that developed over many decades.

A multi-disciplinary National Antibiotic Committee (NAC) has been established to coordinate national initiatives such as

- Promoting the understanding of and support for correct prescribing, dispensing and use of antibiotics amongst medical, pharmaceutical and veterinary professionals as well as the public at large.
- Coordinating strategies to ensure the continued effectiveness of antibiotic agents used in the treatment and prevention of infectious diseases in humans and animals.
- Developing and recommending strategies to comply with directives and recommendations issued by the European Union on antibiotic use and resistance.
- Advising the Superintendent of Public Health on measures necessary to minimise antimicrobial resistance.
- Fostering the development of written guidelines and recommendations for evidence-based use of antibiotics in both hospitals and community settings. In order to address this issue, in 2011 the NAC has published its first set of guidelines for prescribing of antibiotics in ambulatory care.
- Reacting in a timely and realistic way to acute problems in the field of antimicrobial resistance as they arise.
- Keeping abreast of the latest research and recommendations on antibiotic use and resistance and disseminate such information.
- Tendering all such advice as may be requested by the Superintendent of Public Health.

Surveillance is also undertaken on antimicrobial resistance and antibiotic consumption in hospital.

Malta is an active participant in three European projects namely:

- EARSS – European Antimicrobial Resistance Surveillance System.
- ESAC – European Surveillance of Antimicrobial Consumption
- ARPAC – Antibiotic Resistance Prevention and Control

B-Haemolytic streptococci

Group A β-Haemolytic streptococcal disease involves a whole spectrum of infections from simple pharyngitis/tonsillitis, sore throat, impetigo etc to severe invasive disease

such as pneumonia, peritonitis and necrotising fasciitis. It is the latter group of infections that can cause dramatic disease with a high mortality rate if not treated early. A number of invasive infections have been recorded on a yearly basis and some have ended up in law suits.

Group B β-Haemolytic streptococci (GBS) on the other hand cause neonatal disease of two types. The so called early onset GBS disease occurs within the first week of delivery where the infection is acquired in utero or during vaginal delivery. Here septicaemia, pneumonia and less commonly meningitis, osteomyelitis or septic arthritis can occur. Late onset disease however occurs after the first week of delivery and is transmitted through person-to-person contact and mostly presents as septicaemia and meningitis.

An outbreak of late onset GBS occurred in Malta in May 2012 involving two new born infants of whom one passed away on the 17th day of life. In addition she had severe cardiac malformations that were deemed inoperable. The second child survived the infection but the mental state function was to be evaluated with time as the child grew as long term sequelae are common.

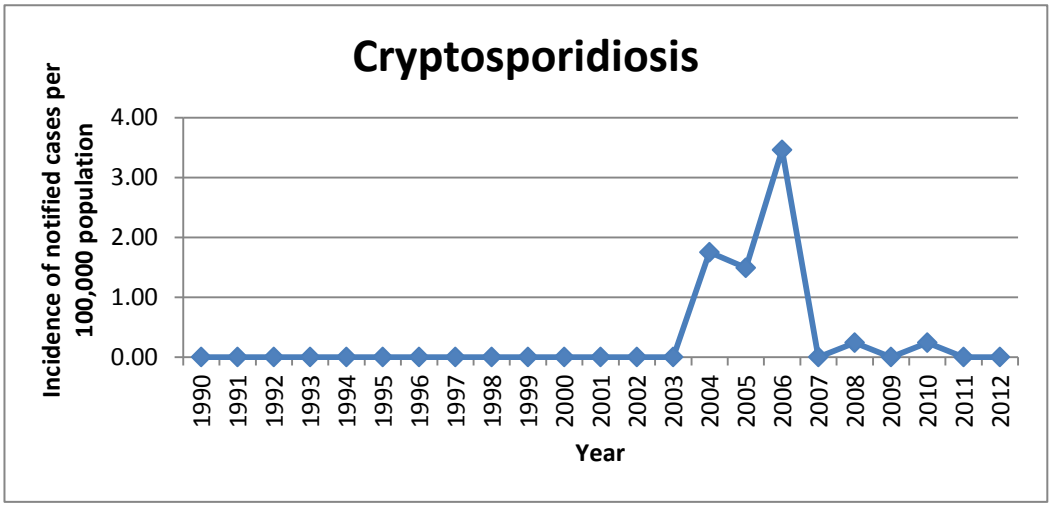
It should be said that several European and other countries have instituted prenatal GBS-screening between 35-37 weeks gestation. Other countries such as the UK have instituted a risk-based approach to identify mothers who would be offered and treated with intra-partum antibiotic prophylaxis. (Brocklehurst P et al, 2008)

Cryptosporidiosis

Occurrence of Cryptosporidium infection is worldwide. Cryptosporidium oocysts have been identified in human faecal specimens from more than 50 countries. In industrialised countries, prevalence of infection is less than 1%-4.5% of individuals surveyed by stool examination. In developing countries, prevalence ranges from 3% to 20% (Snelling WJ, 2007)

In Malta, there was an upsurge of cases during the period 2004-2006. After this time the trend was on the decline (Figure 3).

Figure 3: Reported incidence of sporadic Cryptosporidium cases, Malta, 1990-2012



Cytomegalovirus

Cytomegalovirus is acquired by direct contact, blood transfusion or organ transplantation. After acute infection cytomegalovirus becomes latent but the infection may reactivate at times of stress if immunocompromised. In the past 10 years only 6 cases of cytomegalovirus infection has been notified in Malta.

Dengue

Dengue fever is a painful, debilitating mosquito-borne disease caused by any one of four closely related dengue viruses. These viruses are related to the viruses that cause West Nile infection and Yellow fever.

Each year, an estimated 100 million cases of dengue fever occur worldwide. Most of these are in tropical areas of the world, with the greatest risk occurring in:
The Indian subcontinent
Southeast Asia
Southern China
Taiwan
The Pacific Islands
The Caribbean (except Cuba and the Cayman Islands)
Mexico
Africa
Central and South America (except Chile, Paraguay, and Argentina)

Dengue fever is transmitted by the bite of an Aedes mosquito infected with a dengue virus. The mosquito becomes infected when it bites a person with dengue virus in their blood. It cannot be spread directly from one person to another person.

To date, there have been 2 reported cases of dengue fever in Malta in 2005 and 2010 respectively, both of which were imported. The Health Promotion and Disease Prevention Directorate are mapping the presence of the vectors that have carried the

killer disease to mainland Europe – *Aedes albopictus*, also known as the Asian tiger mosquito (Buhagiar J et al, 2009).

The presence of *A. albopictus* (Skuse, 1894) has been confirmed in Malta (Gatt *et al.*, 2009). Three more adult female mosquitoes were caught indoors by the author from another locality (Marsascala) located in east Malta, and identified from morphological features. This is the second time this species has been recorded for the Maltese archipelago and represents an addition to the nine previously recorded Culicidae mosquito species from the Maltese Islands. Since the species is a known vector for several serious diseases including dengue fever, its occurrence in the Maltese islands has been noted by the Health Authorities and measures to contain its spread and/or prevent its establishment undertaken.

The arrival of *A. albopictus* in Malta is not surprising given the large volume of container based sea traffic where Malta Freeport acts as a hub terminal for transhipment in the Mediterranean. A large number of cruise liners also call regularly at the Valletta Grand Harbour and several ferries link with mainland Italy and Sicily. Though transport of old car tyres has been cited as the possible route of import, this is probably not applicable locally but sea traffic offers instances where adult insects or their immature stages can hitch a ride. Eggs are known to withstand desiccation and therefore can be transported in a variety of containers. The arrival of *A. albopictus* with lucky bamboo imports is not excluded; there are regular imports of horticultural plants from the Netherlands and Italy on a weekly basis and the plant in question is quite popular locally. The crucial question remains whether it will survive over winter and become established such that its numbers increase to pose a health risk.

The climate in the Maltese Islands is relatively warm and mild even during the rainy season which stretches from September to March/April with outdoor temperatures rarely falling below 0°C. The hot summers are dry but the presence of water in reservoirs and distribution canals can extend its active breeding season. Therefore these climatic and environmental factors alone may favour its establishment locally. This represents a potentially dangerous addition to the nine previously recorded Culicidae mosquito species from the Maltese Islands of which a few are potential vectors for harmful viral disease but considered as low risk due to the small numbers present (Gatt, 1996; 2009). The primary concern if the species becomes established locally is the risk of transmitting disease and therefore its public health burden.

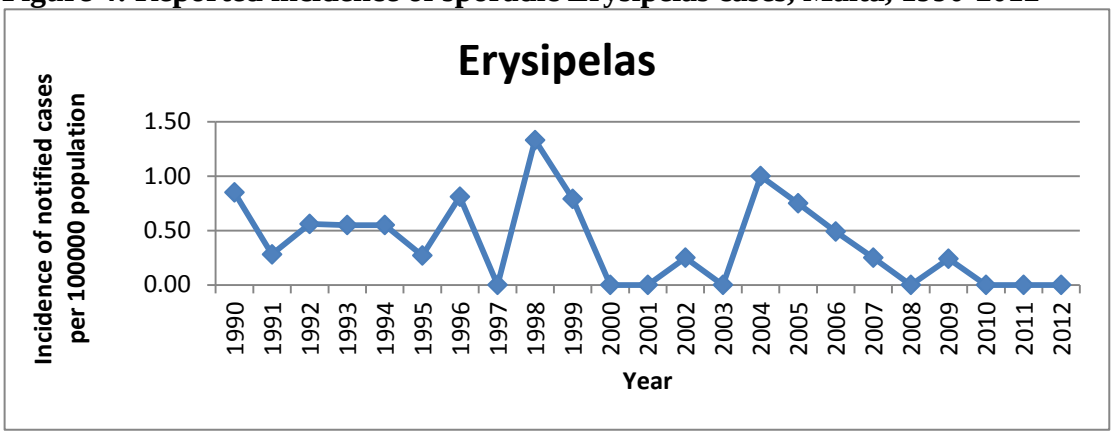
Furthermore, the continuous influx of migrants from North Africa to the Island which often hail from epidemic areas, may pose an added risk if infected migrants are bitten by the mosquito. Measures should therefore be taken by the local health and sanitation authorities to carry out an intensive field survey to record the extent of local establishment of *A. albopictus* and prepare measures to contain its further spread.

Erysipelas

This infection causes a rapidly spreading red oedematous, tender plaque-like area of skin usually on the lower leg. The patient is often febrile and may be associated with lymphangitis or lymphadenitis. This infection is most commonly caused by streptococcus group A, B, C, G, but rarely can be caused by *Staphylococcus aureus*.

In Malta, an increase in reported cases was noted in 1998 and 2004. Since then, the trend has been decreasing with no cases being reported in the past 3 years.

Figure 4: Reported incidence of sporadic Erysipelas cases, Malta, 1990-2012



FOODBORNE ILLNESS / INFECTIOUS INTESTINAL ILLNESS

Zoonoses and Foodborne illness

The objective of food and water borne disease surveillance is to investigate notified cases as soon as possible in order to minimise the spread of illness, prevent recurrence and to learn how to prevent similar outbreaks in the future. There are also international obligations which necessitate timely reporting to and collaboration with EU agencies such as ECDC the European Food Safety Authority (EFSA).

BRUCELLOSIS

No endemic brucella (*Brucella Melitensis*) has occurred in Malta since the last case in 1998. A previous outbreak occurred 1995 when 225 persons were affected. The fifteen year period-free of disease (1998-2012) is largely attributed to stringent controls undertaken by the Veterinary Department and the Directorate for Environmental Health on a regular basis.
Officially registered farms are strictly controlled, with all animals tagged according to legislation and a detailed data base is kept on each animal together with their movements when they are sold or bought. The remote possibility of having illegal farms or single animals that are not registered or tagged may still be present, there could still be a potential reservoir of disease.

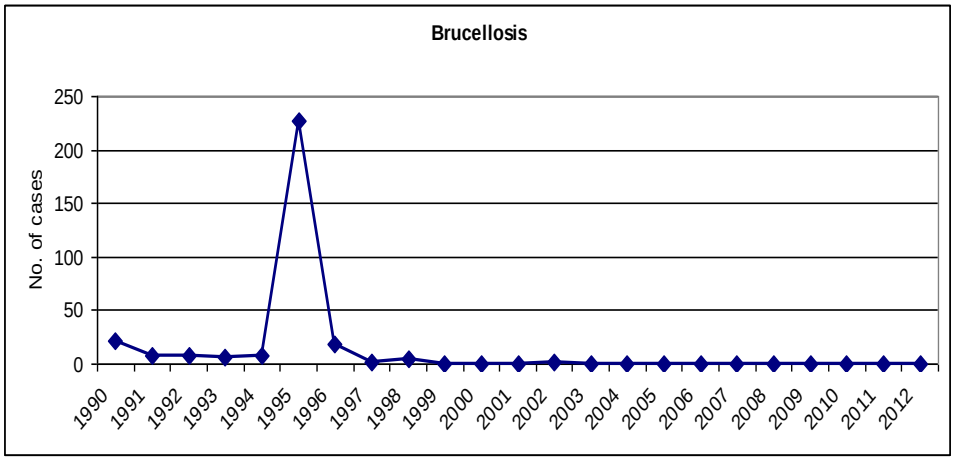
Imported cows are all certified as brucellosis free, whereas no goats or sheep have been imported over several years.

Locally, surveillance of brucella is done in goats, sheep and cows by the Veterinary Department. These animals are tested serologically every 6 months, for Brucella, Listeria and TB by means of a rapid agglutination test (Rose Bengal Test). Positive cases undergo further testing using enzyme-linked immunosorbent assay (ELISA) If this test is also positive a blood sample is sent to the UK laboratory. If positivity is again confirmed the animal is slaughtered and its lymph nodes are collected and sent to the UK for further testing. Bulls for fattening are tested at the slaughter stage.

In addition samples of milk are elevated from milk collections from herds and screened twice a year. If any samples are positive then that herd is tested as above. Of note is that *Brucella melitensis* in ovines and caprines is still relatively common in some Mediterranean countries such as Greece, Italy, and Spain (EFSA, 2013).

In conclusion, the risk of re-emergence of endemic human brucellosis is small but the possibility of imported brucellosis in humans is possible. For now all measures and surveillance in humans and animals remains necessary. The aggregation of data and preparation for the attainment of a Brucella-free-status for Malta will be undertaken in 2013.

Figure 5: Reported number of sporadic cases of Brucellosis, Malta, 1990-2012



FOODBORNE ILLNESS/INFECTIOUS INTESTINAL ILLNESS

Foodborne illnesses resulting from contaminated food and water remain a major public health problem worldwide (Mead et al, 2009). Morbidity is high especially at the extremes of life and mortality is considerable in underdeveloped countries. The implications for the food industry and trade are significant. Increasing de-regulation of food industry puts the responsibility on the manufacturer. Surveillance of foodborne illness remains increasingly important to monitor the effectiveness of quality assurance programmes.

The overall picture of reported food related disease is not reflective of the amount of illness in the community as the majority of cases do not reach surveillance systems. It is thought that only a small percentage of cases are notified and these are usually the most severe cases (often hospitalised) as well as cases involved in outbreaks. The rest

are likely to be self-treated or treated in the community by physicians (C Gauci et al, 2007).

Foodborne illness notifications in Malta are obtained from the following sources:

Disease surveillance
Passive surveillance based on official notifications to the Infectious Disease Prevention and Control Unit (IDCU). The system includes notifications from general practitioners and hospital physicians, and also direct notifications from the public. Occasionally deaths attributed to foodborne illness are also notified to the IDCU through the Department of Health Information and Research, which processes all death certificates.

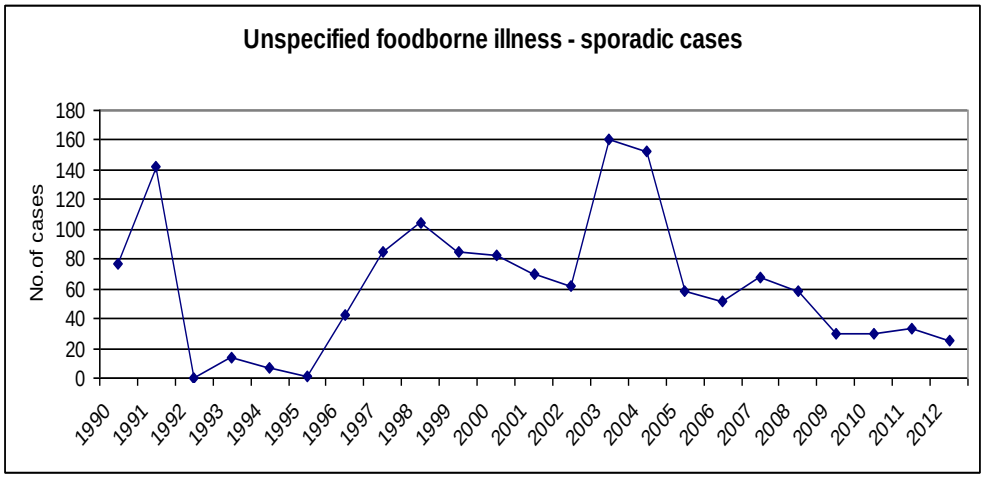
Laboratory Surveillance
A system based on laboratory reports submitted from the state hospital microbiology laboratory of the Department of Pathology at MDH and private medical diagnostic laboratories. Stool samples are screened for four parameters namely: Salmonella, Campylobacter, E. coli and Shigella. Listeria, Yersiniosis and Giardiasis are uncommon as is hepatitis A. There is no testing for echinococcosis and trichinella (but no endemic human disease has been reported by physicians)

Unspecified foodborne illness

Where the etiological agent is not identified foodborne illness is classified as unspecified. Various reasons may be the cause of this such as late notifications, unwillingness to submit a stool sample or negative stool cultures (where other pathogens that may not be routinely tested for e.g. viral are as likely). The rates of sporadic cases of unspecified foodborne illness in Malta since 1990 showed a peak in 2003-2004 , but since then there has been a steady decline in cases.(Figure 6)

The frequency of disease in this category may not be comparable over time owing to changes in laboratory diagnostics, reporting rates, individual medical and case preferences and knowledge of disease as well as varying severity of disease which may all influence notification. In addition, over time, varying pathogen predominance and recognition (Mead et al, 2009) as well as improved food safety and hygiene practices may have occurred.

Figure 6: Number of reported cases of unspecified sporadic foodborne illness, Malta, 1990-2012



Unspecified foodborne illness outbreaks are events involving two or more persons related in time to the same meal/establishment and where the causative agent is not identified. The rate in Malta has shown considerable variation of over the years with peaks every few years usually associated with large outbreaks, often related to receptions or large dinners (Figure 7). The period 2006-2010 particularly has had a lower than usual rates of notified disease in this class. These illnesses indicate that the threat for large scale outbreaks still exists and is likely to remain. Thus food handling education and awareness as well as regulation and vigilance for food safety in food producing establishments and industry remain a high priority.

Figure 7: Number of reported Unspecified foodborne illness outbreaks, Malta, 1990-2012

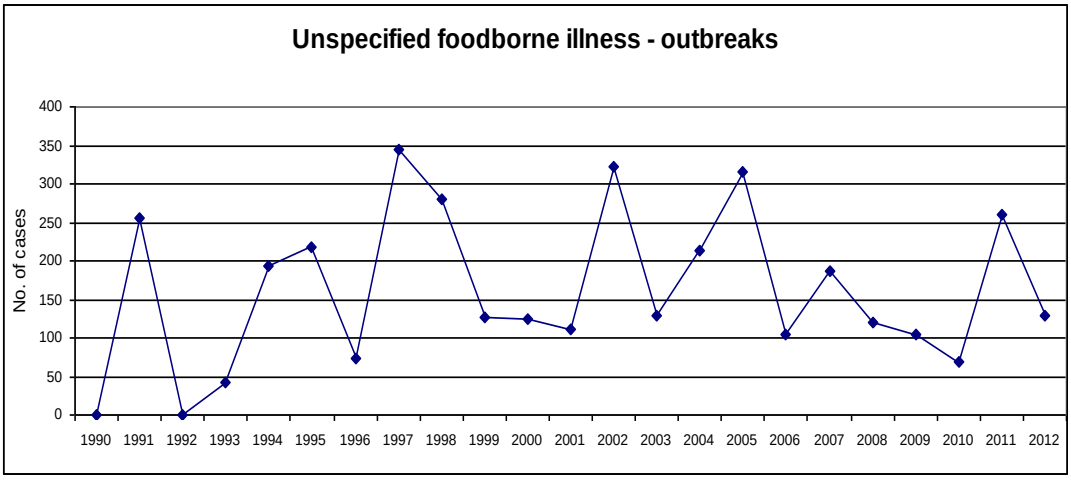
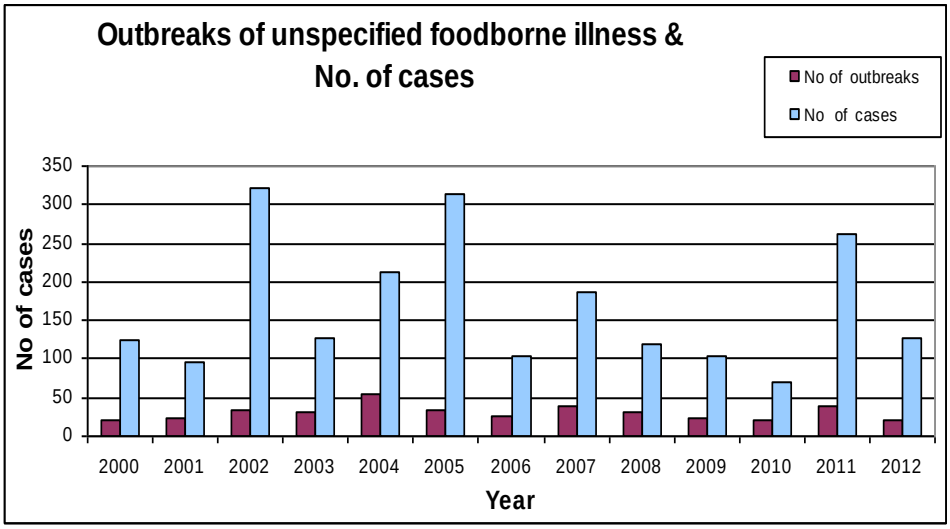


Figure 8: Outbreaks of unspecified foodborne illness, Malta, 2000-2012.



Assuming that the number of sporadic cases are episodes (rather then individuals), in this 13 year period there were a total of 882 episodes compared to 404 episodes of outbreaks where the latter have affected a total of 2173 persons (Table 3). Thus more than twice the number of persons were affected in outbreaks.

Table 3: Notified unspecified foodborne outbreaks compared with the total number of cases per year, Malta, 2000-2012

Unspecified foodborne illness	Total number	Mean/ annum	Range	95% CI
Sporadic cases	882	68	25-160	163-170
Outbreaks	404	31	22-54	22– 40
Cases (involved in outbreaks)	2173	167	69-322	163 – 170

For the descriptive purposes of this document a large outbreak is being described as that in which 5 or more persons have been affected. Other smaller outbreaks or clusters affecting less than 5 cases in general. For other instances, classification depends on the background incidence of the disease.

The overall burden of this class (unspecified) of foodborne illness is unknown. A greater number of persons are likely to be affected oftener in smaller outbreaks.

Table 4: Distribution of unspecified foodborne outbreaks by magnitude of outbreak, Malta, 2009-2012

Year	2009	2010	2011	2012
No of large outbreaks (≥5 cases)	3	4	15	7
No of small Outbreaks (<5 cases)	19	17	25	21
Total no. of Outbreaks	22	21	40	28

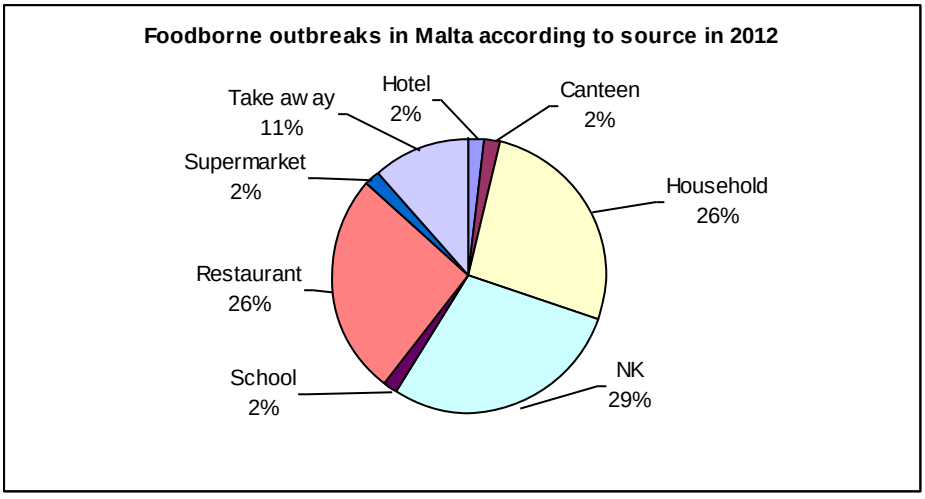
In this four year period large outbreaks represent a mean of 23% (range 13.6% - 37.5%) of the total outbreaks (Table 4). It is thought that the larger an outbreak is the greater the likelihood of being reported. The true burden of disease in this class of foodborne illness is not known as small outbreaks as well as the milder the symptoms are the less likely are they to be reported.

Though small infectious intestinal disease outbreaks from whatever cause (unspecified, Salmonella, Campylobacter, etc) are common they are identified because of the sensitive local infectious disease surveillance system. However, it is unlikely that they are frequently reported as outbreaks. The epidemiological linkage and confirmatory evidence in small outbreaks, especially if unspecified foodborne, is indeed weak and they are as likely to be brought about by other causes such as viral conditions.

Sources of exposure to foodborne disease

Foodborne outbreaks from whatever cause (unknown and known pathogen) can be classified according to the suspected source. In 2012, 26% of the foodborne outbreaks were linked to restaurants and households equally. Take aways represented 11% of the outbreak source whereas in 29% of the outbreaks a source could not be identified (Figure 9). One hotel outbreak was related to a buffet dinner whereas another outbreak was likely caused by norovirus contaminated food in a school party.

Figure 9: Foodborne outbreaks (from all reported causes) and their suspected source of exposure, Malta, 2012

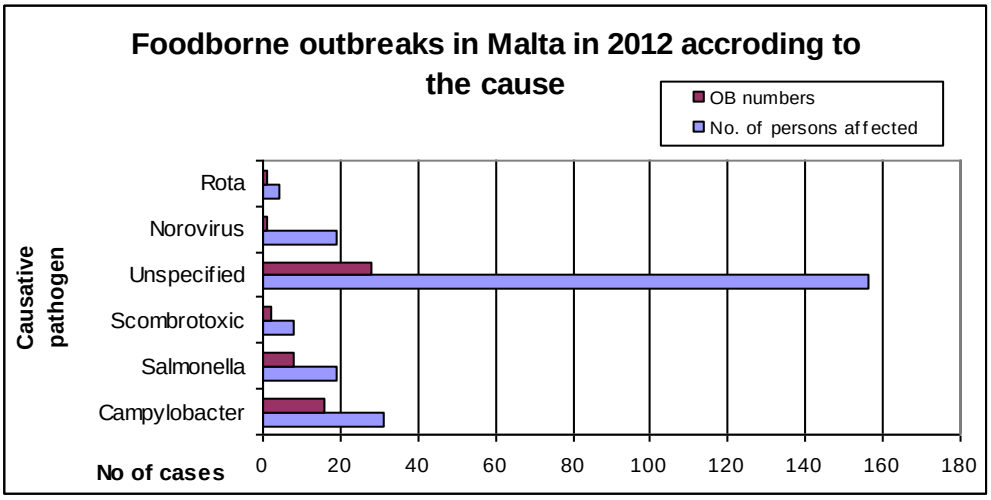


Foodborne outbreaks and the causative pathogen

Half the cases of foodborne outbreaks remain unclassified (unspecified foodborne outbreaks) (Figure 10). This can be due to various reasons mainly because many people refuse to give stool samples; no pathogens are cultivated from collected samples or notification is delayed making sample collection unfeasable. Some of these are possibly viral in origin.

In 2012, Salmonella was responsible for more than 14 % of the foodborne outbreaks while Campylobacter represent double the rate (28%). During 2012 a total of 237 persons (male: female ratio= 1:1) are known to have been affected in the reported outbreaks.

Figure 10: Foodborne outbreaks by pathogen type, Malta, 2012



Salmonella

Since 1992, there has been a general persistent decline in the overall crude incidence trends in Salmonella notifications. Following a peak in the disease in 1994 there has been another but smaller peak in 2008 and 2010. This followed an all time low in 2000-2001. Longer term trends are unknown (Fig 11).

The average notified Salmonella rate shows almost 25 cases per 100,000 populations in the 23 year period 1990-2012. (Range 8-58.25, 95% CI: 19 – 30). The EU salmonella confirmed cases average in 2012 was 22.2/100,000 population with a range of 1.8 in Portugal to 97.5 in the Czech Republic (EU summary report, 2012).

Figure 11: Reported laboratory confirmed Salmonella incidence rate, Malta, 1990-2012

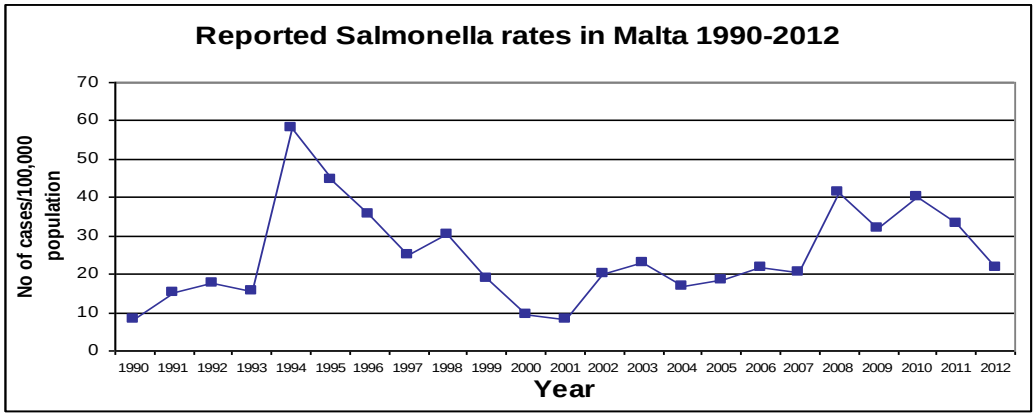
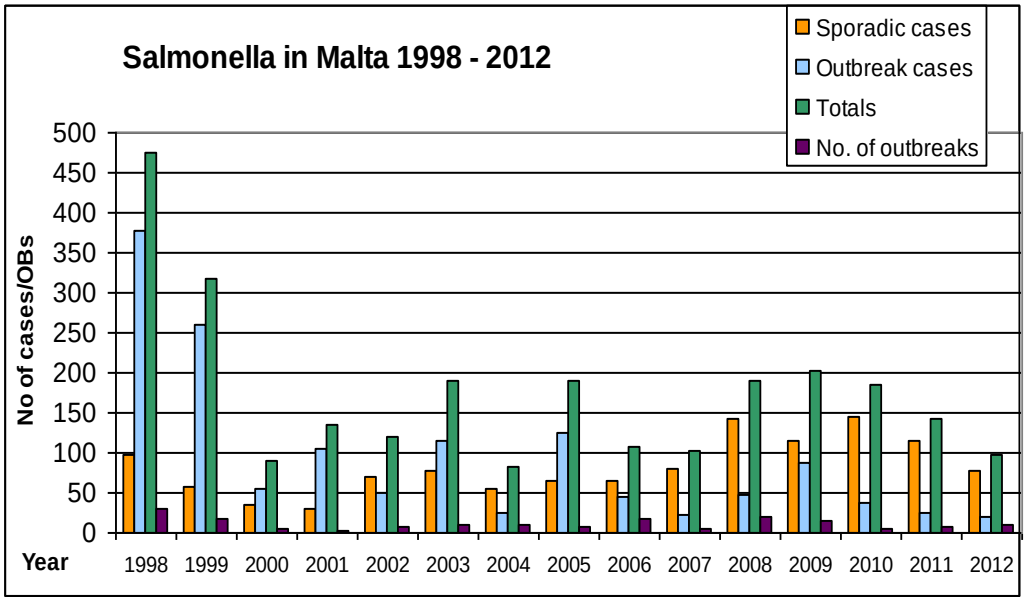


Figure 12: Reported cases of Salmonella divided according to sporadic (confirmed) and outbreak cases (confirmed and epi-linked) related to the estimated total number outbreaks, Malta, 1999-2012



Between 1998 and 2012, the number of outbreaks varied from year to year with a minimum of 3 in 2001 and a high of 29 in 1998 (Figure 12). The total number of persons affected in outbreaks per year varied from 82 in 2004 to 476 in 1998. The latter year was characterised by a high number of reported outbreak affected cases mostly related to a number of food-transmitted outbreaks linked to receptions.

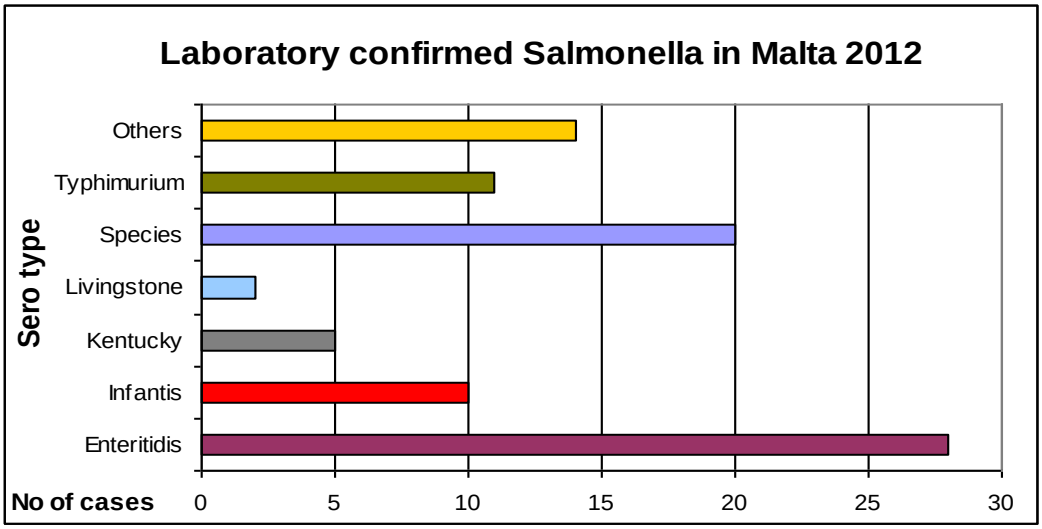
It is worthwhile noting that this may not be the true picture of Salmonella in the country. The picture is likely to be larger as mild to moderate and subclinical cases do not come to the fore. It is not known whether the yearly variations reflect variations in ascertainment, notifications or in incidence of the disease.

Salmonella sero-groups in 2012

Salmonella enteritidis and *Salmonella typhimurium* have remained the commonest serotypes that were isolated in Malta in 2012 as in previous years (Figure 13). However there has been a reduction in the numbers of these serogroups since 2009 because of the EU stimulated salmonella control programme. For *S. enteritidis* the relative frequency decreased from 53% in 2007 to 31% in 2012 and for *S.*

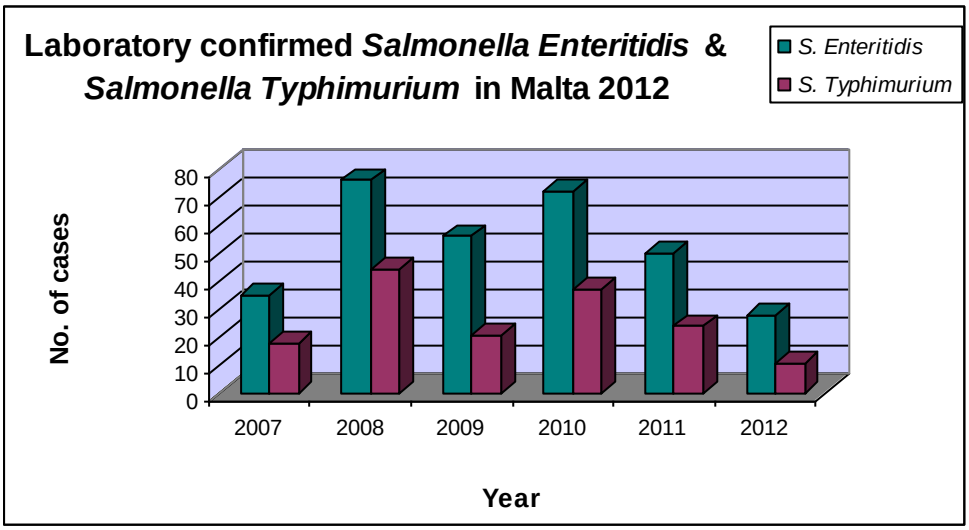
typhimurium the relative frequency went down from a high of 22.5% in 2007 to 12.2% in 2012 (Figure 14)These changes mirror the trend seen in most European countries in the same period of time where *S. enteritids* was identified in 41.3% of human salmonellosis whereas *S. typhimurium* was identified in 22.2% across the EU (EC, 2012).

Figure 13: Laboratory confirmed Salmonella cases by serotype, Malta, 2012



S. enteritidis are most commonly associated with consumption of contaminated eggs and broiler meat, whereas *S. typhimurium* cases most often are associated with consumption of contaminated pig, poultry and bovine meat.

Figure 14 Distribution of cases of *S. enteritidis* and *S. typhimurium*, Malta, 2007-2012



Salmonellosis was commoner in the ages at the extremes of life. Twenty-four percent of cases occurred in the 0-5 age group, 11.1% occurred in the 6-14 age group whereas 23.3% occurred in the age 65 years or older.

Salmonella typhi and *Samonella paratyphi*

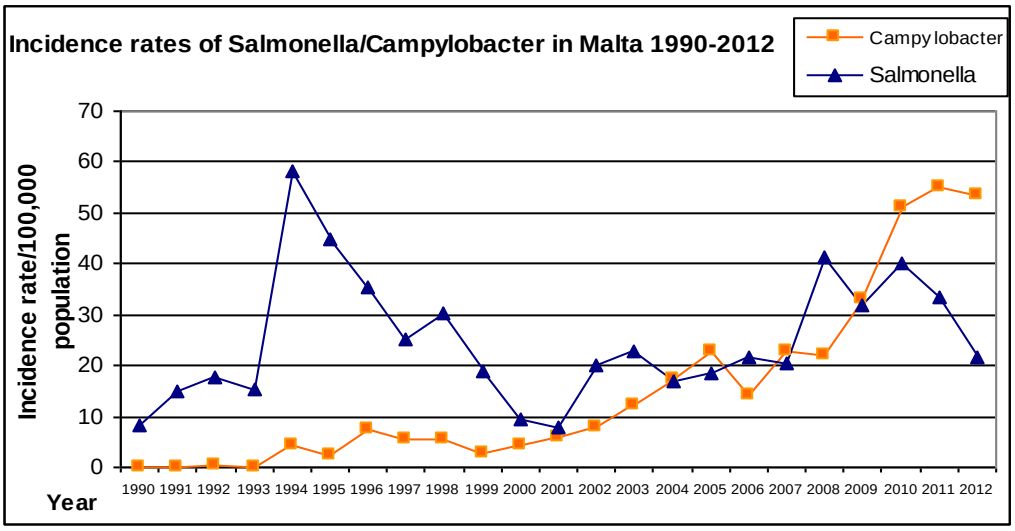
There were two reported cases of *S. typhi* in Malta in 2011.Both were imported from India. A previous case was also imported from the Far East and occurred in 2005 whereas the typhoid case recorded before this was in 1998. The infection was not recorded as autochthonous in the past decade.

Salmonella paratyphi has been recorded three times since 2007 where one case each has occurred in the years 2007, 2009, 2010. The last case was imported from India as well, while the former two cases' origin is not known.

Campylobacteriosis

Campylobacter infections have become common and over the past decade or so this pathogen has caused more disease in Malta and across Europe then the previously predominant Salmonella.

Figure 15: Incidence rates of Salmonella and Campylobacter, Malta, 1990-2012



The notified Campylobacter incidence rate in 2012 was 53.65/100,000 population with an average rate of 15.21 since 1990 (range 0 – 55, 95% CI: 7.63 - 22.78). The average EU campylobacter rate in 2012 was 48.69 (range: 0.39 in Latvia and 174.43 in the Czech Republic) (EC, *2012*).

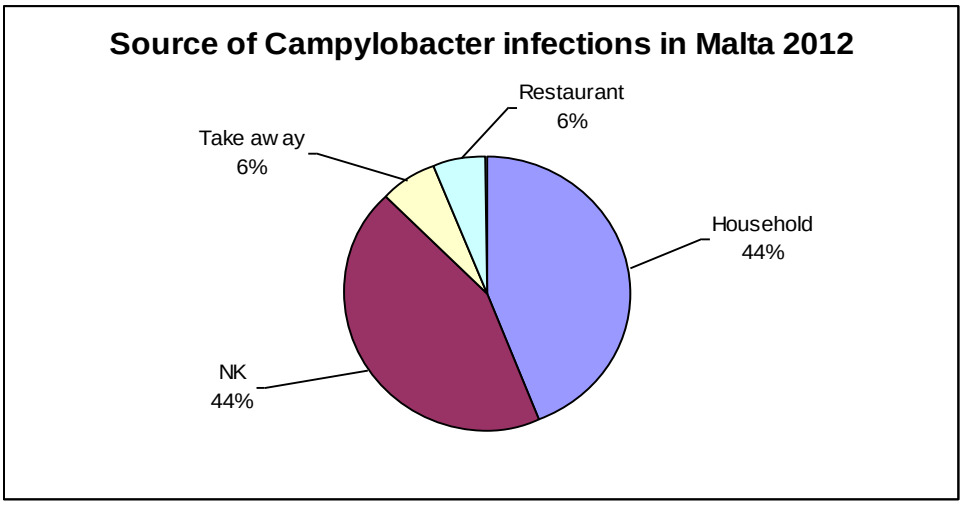
The principal reservoir of Campylobacter is the alimentary tract of domesticated birds and mammals including poultry, cattle, sheep and pigs, but also cats and dogs. Food can be easily contaminated along the food chain or during preparation from raw meats for example. Consumption of poultry and pork meat are commonest sources in many developed countries.

In 2012 twice the number of outbreaks campylobacter (n=16) compared with salmonella were reported. All these outbreaks involved two to three persons. No large outbreaks were recorded linked to this pathogen. Forty-four percent of these outbreaks were linked to households.

Campylobacter jejuni remains the predominant species accounting for 48.1% of the confirmed cases whereas *Campylobacter coli* was responsible for 15.5% of the cases. In 36.4% the serogroup could not be identified.

In 2012, Campylobacteriosis was slightly commoner in males with 53.6% while in females the frequency was 46.4%. Campylobacter was again reported more in the extremes of life similar to other countries with more than 26% in the 0-5 year age group, 14.5% in the 6-14 year olds and 21% in those at 65years or more.

Figure 16: Source of Campylobacter infections, Malta, 2012.
(NK = source not known)

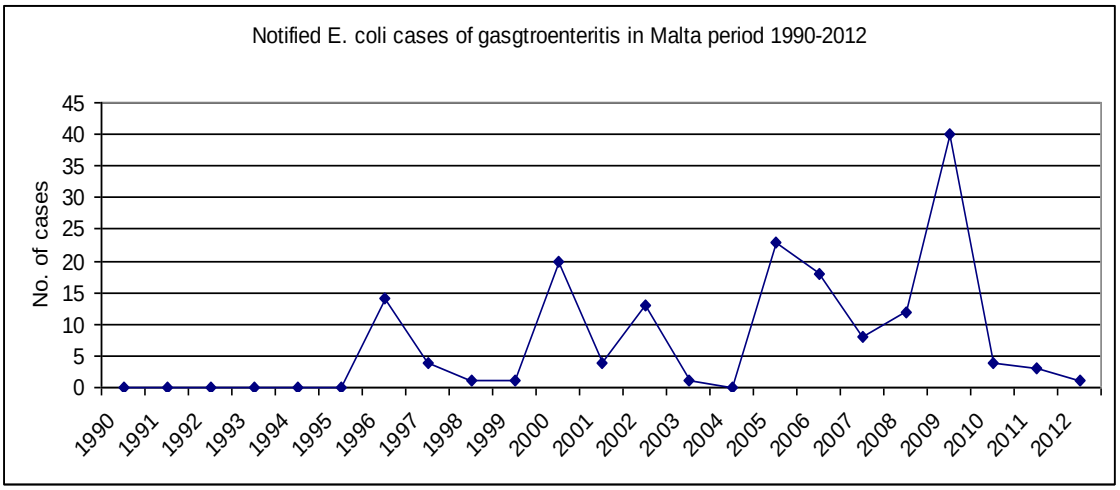


Verocytotoxigeric *Escherichia coli* (0157:H7) and other strains

E. coli infections are uncommon in Malta however since this disease has a high morbidity and possibly mortality, especially if the case develops haemolytic-uraemic syndrome (HUS)), it remains an important zoonotic disease. Like most intestinal diseases that are notified to the surveillance unit, *E. coli* cases are usually notified from hospitalised cases of disease.

Most of the cases reported have occurred in children. During 2012, there was one individual case of *E. coli* 0157 (Figure 17)

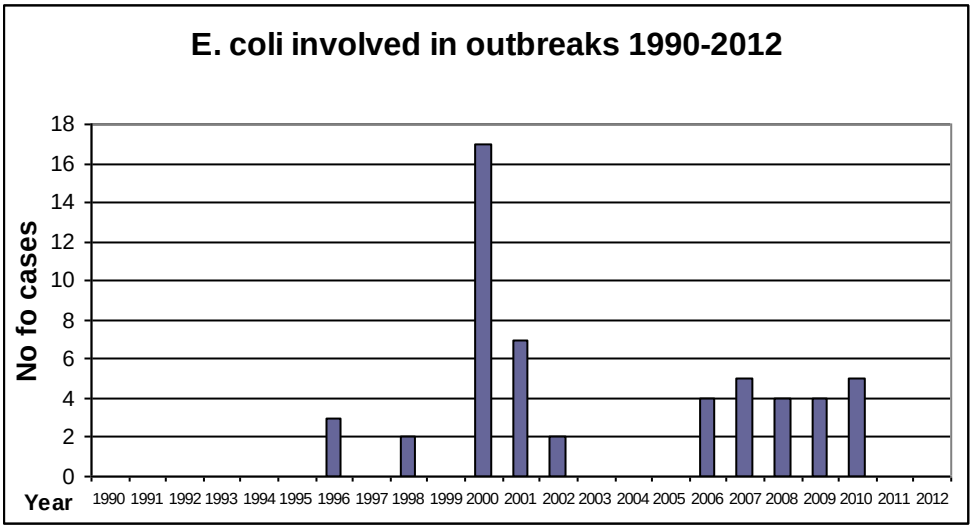
Figure 17: Reported sporadic cases of *E. coli*, Malta, 1990 - 2012.



Identifying the source of exposure for sporadic infections is difficult and none of the cases above could be linked to any particular source. Because of the seriousness of *E.coli* 0157 infections the pathogen is considered to be a serious global public health concern.

E. coli outbreaks are not common in Malta and usually present as small outbreaks of two to three persons. Fortunately HUS has not been recorded in Malta in the past few years. Locally in the year 2000 17 persons were affected in 6 separate outbreaks (Figure 18). This was unusual but is indicative that the potential of outbreaks is real. This is exemplified by the emergence of a new strain of pathogenic *E. coli* when an outbreak of *E. coli* 0104:H4 occurred in Europe in 2011 in which 48 persons died and 1235 persons were affected in Germany alone (WHO, 2011)

Figure 18: Number of notified *E. coli* outbreaks, Malta, 1990-2012.



Surveillance of *E.coli* infections remains necessary, as much as good laboratory testing capacity and good physician awareness to detect, treat as well act early when an outbreak strikes.

Bacillus cereus

Bacillus cereus infections (sporadic and outbreaks) in Malta are rare. The last reported outbreak was in 1996 when a large outbreak was reported. Since then a few clusters have been suspected to be caused by this pathogen but were not collaborated by laboratory investigations.

This pathogen is capable of causing outbreaks that can be considerable in size and affect large number of persons. Gastroenteritis is the effect of an enterotoxin that is produced when foods are improperly cooked, where heat resistant spores of the bacterium are then allowed to germinate and grow if food is not kept at proper temperatures. Most infections are however self-limiting.

Listeria

Listeria is a rare disease in Malta (as in other countries) with four cases reported in the three year period 2010-2012. From 1990-2009 no *Listeria* cases were notified. *Listeria* is an opportunistic human pathogen. It is most prevalent in the elderly, pregnant mothers, and AIDS patients. *Listeria monocytogenes* is the most common culprit of human infections.

Listeria is a ubiquitous organism found in soil and plant matter and water leading to vegetable contamination. Animals can also be carriers. *Listeria* has been found in uncooked meats; uncooked vegetables, fruit such as cantaloupes, pasteurized or unpasteurized milk, soft cheeses and processed foods. Pasteurization and sufficient cooking kills *Listeria*; however, contamination may occur after cooking and before packaging.

In non-invasive listeriosis, the bacteria will often remain within the digestive tract, causing mild symptoms such muscle pain, fever and diarrhoea lasting only a few days and requiring only supportive care.

Listeria is a potentially lethal foodborne infection and may manifest as invasive disease such as meningitis, or affect newborns due to its ability to penetrate the endothelial layer of the placenta. The case fatality rate for those with a severe form of infection may approach 25%. Although *L. monocytogenes* has low infectivity, it is hardy and can grow in temperatures from 4 °C (refrigerator temperature) to 37 °C.

Preventing listeriosis as a food illness requires effective sanitation of food contact surfaces. Refrigerated foods in the home should be kept below 4°C to discourage bacterial growth. Preventing listeriosis also can be done by carrying out an effective sanitation of food contact surfaces. Pregnant women are advised not to consume soft cheeses particularly soft-ripened cheeses like feta, Brie, Camembert, blue-veined, or Mexican-style *queso blanc.*

Listeriosis is under surveillance of the European Centre for Disease Prevention and Control because of its potential capacity to cause severe illness and death. ECDC/EFSA performed a survey in ready-to-eat foods in 2011 in which 26 EU Member States participated and the rate in the EU was estimated at 0.32/100,000 population. Amongst other conclusions the report states that soft and semi-soft cheese sample rate of contamination at the end of life was 0.47% while high counts were

present in 0.06%. These bacterial counts though infrequent still raise concern for public health and strict production hygiene and good cold chain are prerequisites for risk elimination (EC, 2013)

Giardiasis

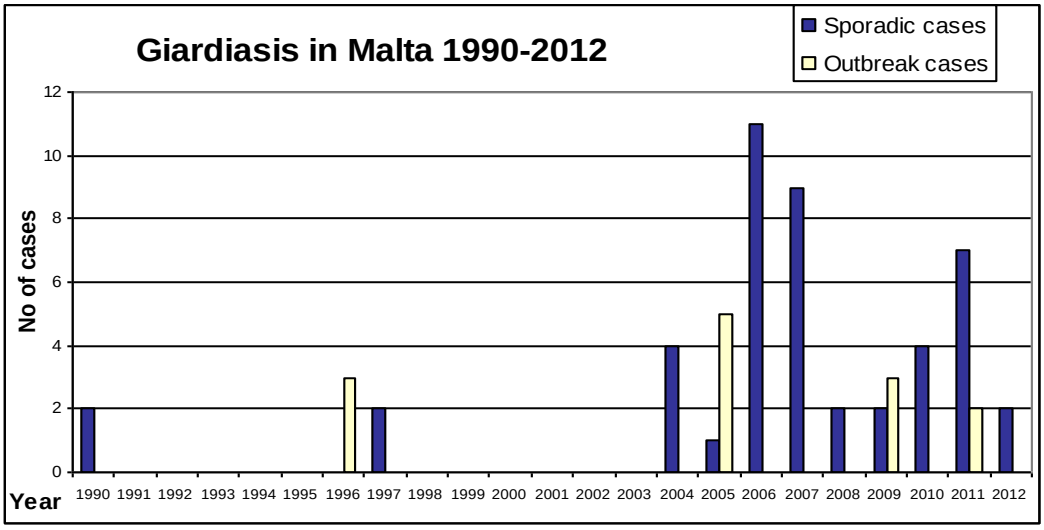
Giardia lamblia is a flagellate protozoan that inhabits the intestines of humans, cattle, cats and dogs etc. It causes gastroenteritis in humans and though infection is self-limiting in most, in others it can cause acute infection requiring hospitalization and treatment, while in others chronic infections may result that may be complicated by malabsorption.

Giardiasis is transmitted via the faecal-oral route. Primary routes are personal contact and contaminated food and water. Institutionalised persons or day-care workers are the most at risk as well as travellers, eating improperly treated food or drink, and people who have contact with individuals already infected.

Public health concern arises because of its capacity to cause outbreaks in households and institutions as well as the potential spread by asymptomatic carriers. Contact testing and treatment is indicated.

Since 2007, 27 human cases of giardiasis were recorded in the national surveillance system with the male to female ratio being 16:11. During this period one outbreak of three persons was recorded.

Figure 19: Reported cases of Giardiasis by sporadic and outbreak status, Malta, 1990-2012



For the decade 2003-2012, 33 cases were reported in Malta with an average of 3.3 cases per year. There was a peak in 2006 when 11 cases were reported (Figure 19). Since 2007 almost 54% of the cases were imported, mostly diagnosed in children adopted from other countries. Outbreaks of giardiasis are even rarer.

Shigella

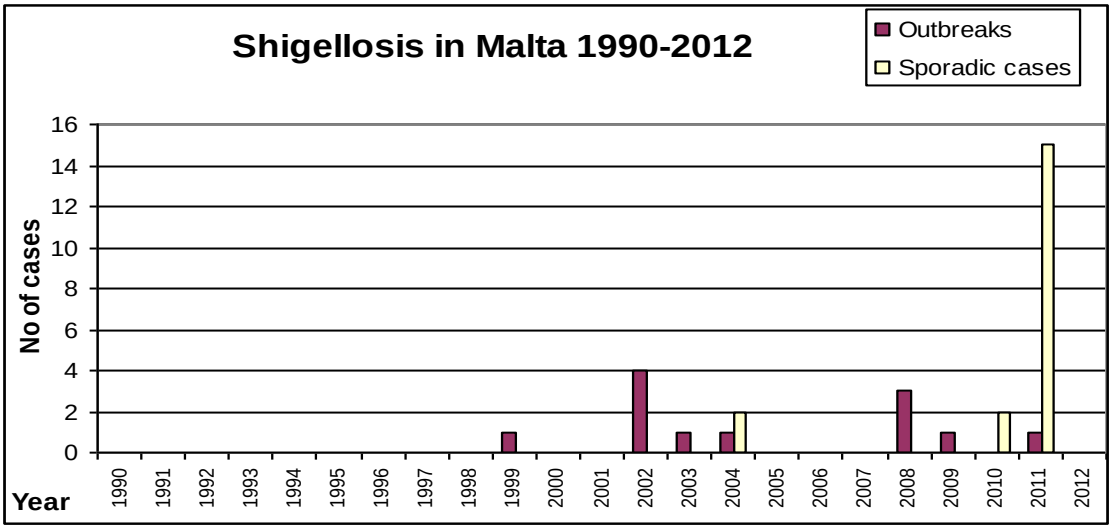
Shigellosis is another intestinal pathogen that is also under surveillance by ECDC. Shigella causes gastroenteritis in human beings and while most infections can be self limiting, others may be more severe and need hospitalisation where symptoms can be severe with bloody diarrhoea and dehydration.

The causative organism is frequently found in water polluted with human faeces, and is transmitted via the faecal-oral route. The usual mode of transmission is direct person-to-person or hand-to-mouth, in the setting of poor hygiene especially amongst children.

Shigella can be transmitted through uncooked food such as salads or cooked foods prepared during unsanitary handling by food handlers. Contamination of these foods is usually through the faecal-oral route. Apart from hand-to-mouth infection, Shigellosis is also transmitted through fomites, water and mechanical vectors like houseflies.

Shigellosis in Malta is uncommon. The majority of cases are sporadic cases whereas two outbreaks were imported from Africa in 2012 one involving 5 persons and the other 10 persons (Figure 20). The potential for outbreaks is self evident. Most of these cases were likely caused by contaminated food or water where person-to-person spread was also possible.

Figure 20: Reported sporadic and outbreak cases of Shigellosis, Malta, 1990-2012



Norovirus

Norovirus has come to the fore in Malta since 2006 with the advent of laboratory testing. It is more commonly and colloquially known as gastric flu, though the term might also be indicative of other viral caused gastroenteritis. It is caused by a highly infectious RNA virus that is resistant to ordinary methods of disinfection. The virus has the potential to cause large outbreaks most especially in institutions, hospitals and cruise ships. It is also responsible for community wide 'epidemics' that are more likely in the colder months of the year (hence winter vomiting disease).

Norovirus causes gastroenteritis that is often of sudden onset with predominant vomiting. Fever is usually mild if at all present. It is usually self limiting but can be problematic at the extremes of life causing dehydration necessitating hospitalization. Deaths are very rare but can complicate infections especially in frail, elderly persons with co-morbidities.

The virus is easily transmitted via fomites by means of contaminated hands; aerosol transmission during episodes of vomiting as well as during the handling of soiled linen etc. Transmission via contaminated food and water is also frequent where infected food handlers do not observe adequate personal hygiene.

Figures 21 and 22 are indicative of the widespread infections caused by norovirus. Infections in hotels may also cause problems to the tourist industry as hotels may need to shuttle arrivals to other tourist complexes to prevent exposure and infection. In addition cleaning and materials used for cleaning may be considerable financial burden on the industry. Figure 23 shows the large number of persons that can be infected in norovirus outbreaks. Most of these outbreaks occur in facilities for long-term care or hospitals causing a considerable burden on the system.

Figure 21: Number of cases involved in outbreaks of Norovirus disease, Malta 2005-2012

(Bold numbers indicate total number of persons affected while the italic bold numbers indicate the number of outbreaks.)

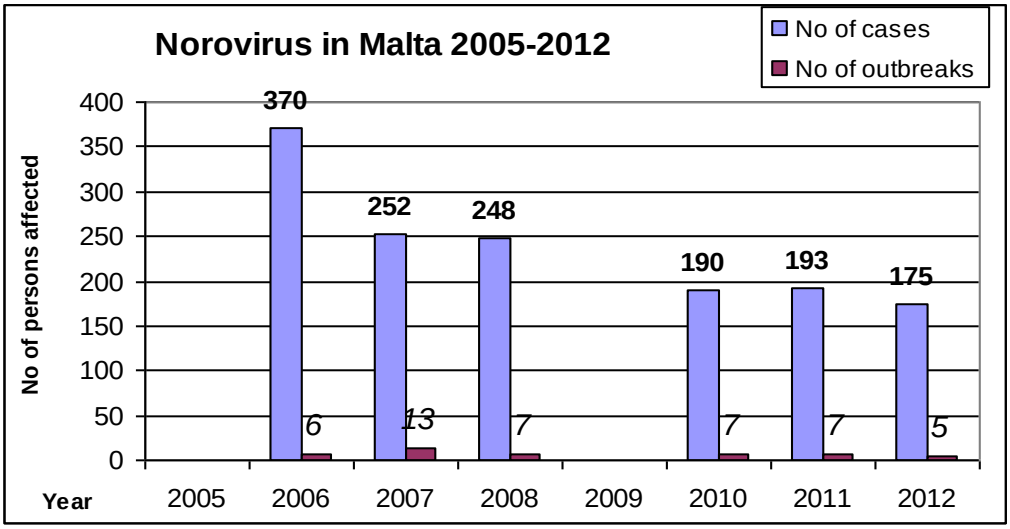
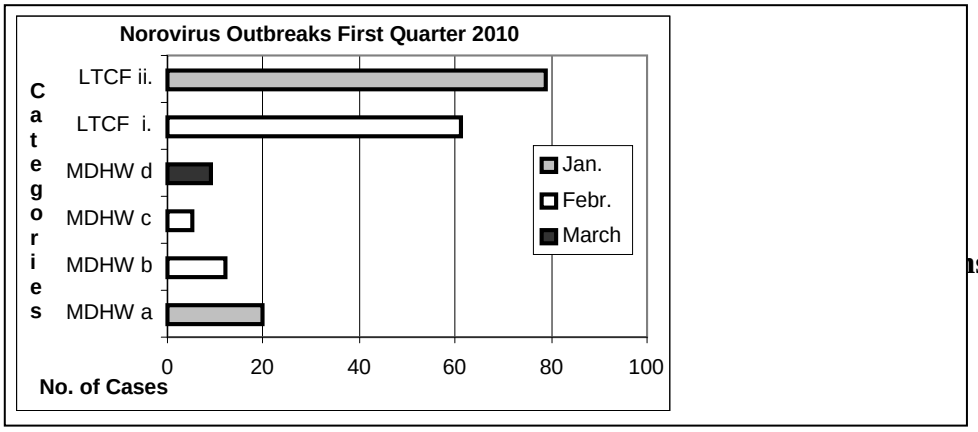
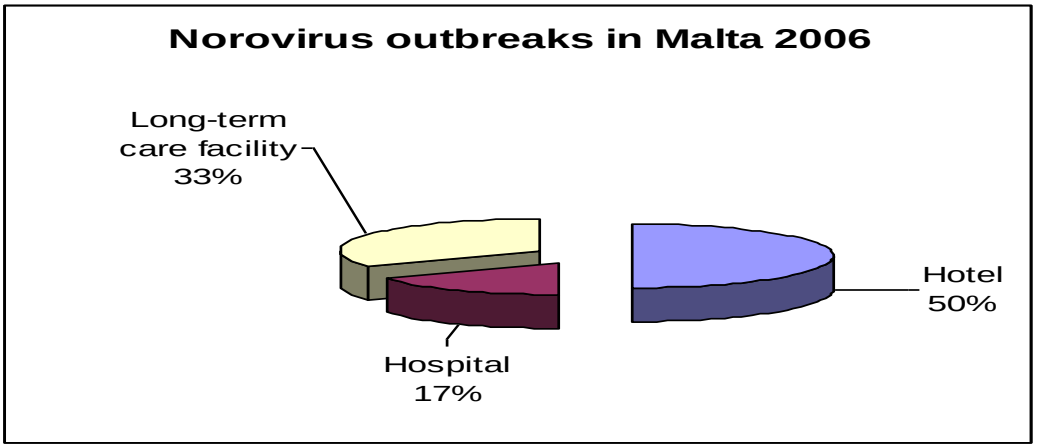


Figure 22: Reported Norovirus outbreaks, Malta, January-April 2010.



nstitutional



In conclusion norovirus can be a potential burden to institutional facilities as well as to the tourist industry. Public health actions will remain a fundamental necessity when cohorts of infections strike requiring investigation, testing of samples and direction of control measures.

Hepatitis A

Hepatitis A is caused by an RNA virus and usually spread by the faecal-oral route. It is transmitted by person-to-person, by the ingestion of contaminated food (such as shellfish) or water or through direct contact with an infectious person. The infection causes hepatitis with resultant jaundice and it is usually self limiting; fulminant hepatitis is very rare.

Hepatitis A is uncommon in Malta with an average of almost 4 cases per year (Figure 24). Outbreaks are even rarer with one outbreak in 2006 and 2009 involving 3 persons each (Figure 25). It remains an important infection because strict control measures are necessary whenever a case is reported requiring public health action. Investigations to seek the possible cause, test foods if necessary, test contacts and provide immunoglobulin treatment as well as hepatitis A vaccine would be required.

Figure 24: Notified Hepatitis A cases, Malta, 1990-2012.

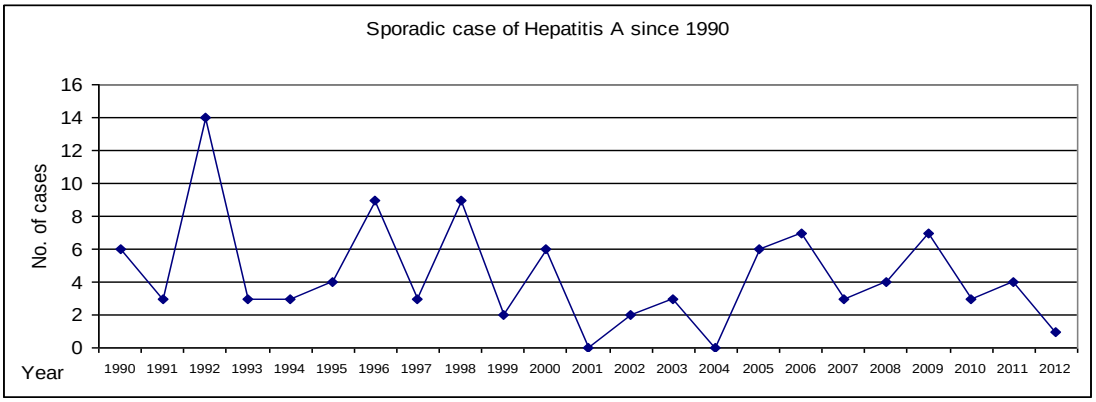
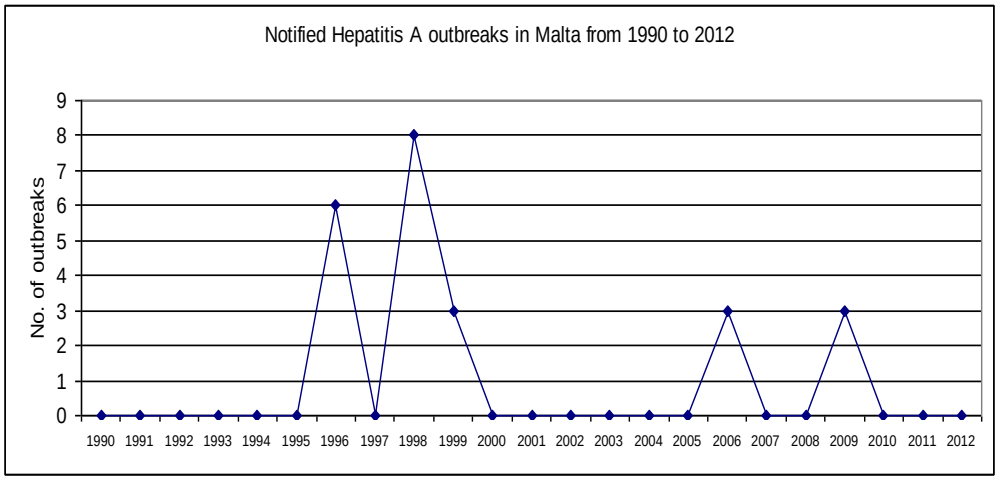


Figure 25: Reported number of outbreaks of Hepatitis A, Malta, 1990-2012



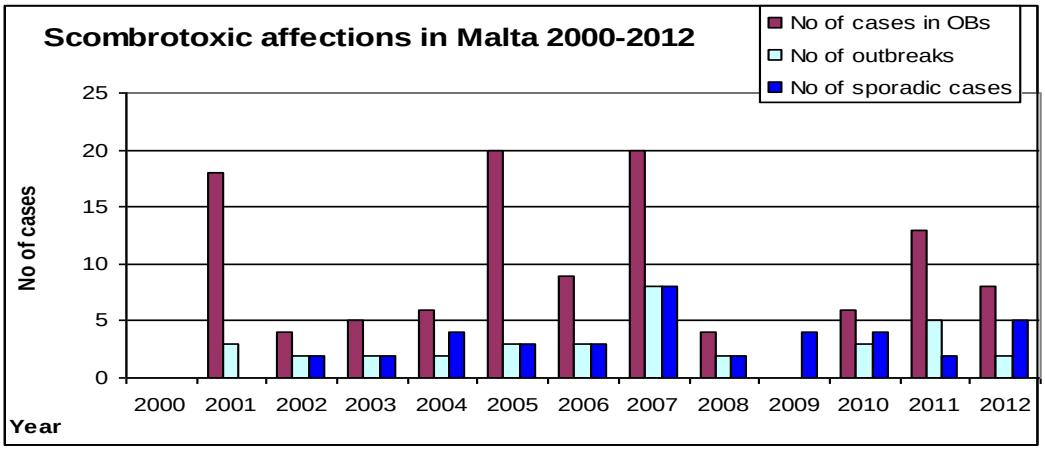
Scombroid food poisoning

Scombrotoxic or histamine foodborne illness as notified to the national surveillance system is uncommon, but likely to be underreported. It is caused by time/temperature abuse of fish with high histidine content such as dolphin fish and fresh and canned tuna. High temperatures at sufficiently long periods of time result in bacterial growth within the fish that transform this amino acid into histamine that is heat resistant.

Outbreaks of scombrotoxic foodborne illness can be relatively large and involve a considerable number of persons as in Figure 26. . Apart from the dramatic nature of the affection a health centre or the emergency department can be inundated with cases in the matter of a few hours.

The incubation period is short and the symptoms are typical such that clinical diagnosis is relatively easy. This form of foodborne illness underlies the need for continuing education to the general public as well as food handlers because it is easily preventable if proper temperature control is maintained throughout the food chain.

Figure 26: Reported numbers of cases of scombrotoxic foodborne illnesses, Malta, 2000-2012



Yersiniosis

Yersinia is another pathogen that causes acute intestinal illness in the young but acute mesenteric adenitis and ileitis mimic appendicitis in older children and adults. A fourth of the infected cases suffer from bloody diarrhoea. The infection by these gram-negative bacteria (usually due to *Yersinia enterocolitica*) is more common in those who are overloaded with iron or are immunosupressed.

In Malta, a single case was reported in 2010 in an adolescent who had iron overload. Across Europe human yersiniosis shows an incidence of 1.76 confirmed cases/100,000 population with a total 6832 cases in 2010. Germany reports the highest number of cases with a rate of 4.09/100,000. The incidence of infections in the EU has been decreasing since 2004 (ECDC, 2012).

Pork is the main reservoir for *Y. enterocolitica* (particularly pork pharynx). Cattle and sheep can also carry pathogenic types. Approximately, two-thirds of cases occur among infants and children. Vehicles implicated in outbreaks in Europe have been attributed to feeding of raw pork to infants. In Malta the case described above was likely to have been linked to raw Maltese sausages.

Infections caused through untreated water or contamination of foods (including milk) by means of faecal-oral contact with infected animals or humans are less common. Clinical disease in animals is uncommon.

Yersiniosis is considered as a foodborne enteric infection but human cases have been reported in association with disease in household pets as well. It is an infectious intestinal illness that is under the surveillance of ECDC and infections require identification and prompt treatment. Surveillance of yersiniosis therefore must be maintained.

Main points on Foodborne Illness

Foodborne illness is a major public health issue since:

- Globally there is an increasing trend in foodborne illness.
- The burden caused by foodborne illness is high.
- Cases are linked to warm weather, the number of cases is expected to increase as global temperatures increase.
- Eating habits are changing. People are increasingly eating foods prepared outside the home
- Mass food production requires the introduction of new technologies with attendant risks.
- New food production methods have brought about changes in agricultural practice. Intensive rearing of animals for food can lead to rapid spread of infection between animals.
- With an increasing number of elderly people in the population, and increasing cases of immunocompromised persons (AIDS, steroid treatment, anti cancer

treatments, transplant patients etc), the population is more vulnerable to the effects of foodborne illness.
- Foodborne illness has an effect on the patient, hospital resources and also an effect on industry, trade and tourism

Consumer Awareness

A local study about consumer awareness on salmonellosis showed that persons who were affected by salmonellosis showed greater awareness on foodborne illness than those who did not (Gauci C, 2000; Gauci C, 2005). Hence we need to increase awareness amongst consumers about the effects of the disease as part of the control of foodborne illness.

Infectious Intestinal Illness

Apart from foodborne illness, which is directly related to the consumption of contaminated food or water, a number of diarrhoeal diseases of infectious origin are prevalent in the community. Hence one needs to monitor all cases of infectious intestinal illness.

Under reporting of infectious intestinal disease is well recognized by the public health community. A population based community cohort study performed in the United Kingdom documented that infectious intestinal disease occurs in 1 in 5 people each year of which only 1 in 6 presents to a general practitioner. The actual number of notified cases is much lower than this (Wheeler JG et al. 1999). This problem of underreporting compromises the quality of surveillance data. A study carried out in Malta estimated the underreporting fraction of infectious intestinal disease (Gauci C et al. 2007)

Describing and quantifying under-reporting may assist in strengthening the surveillance system by

- Identifying where and how cases are lost along the surveillance chain
- Finding ways to reduce loss of data and
- Adjusting for a known magnitude of under reporting.

Leptospirosis

Leptospirosis is an infection caused by the *Leptospira Icterohaemorrhagica and is* uncommon in Malta. It is transmitted when the urine of an infected animal, usually mice, comes in contact with an open skin would or abrasion, the conjunctiva or a mucous membrane.

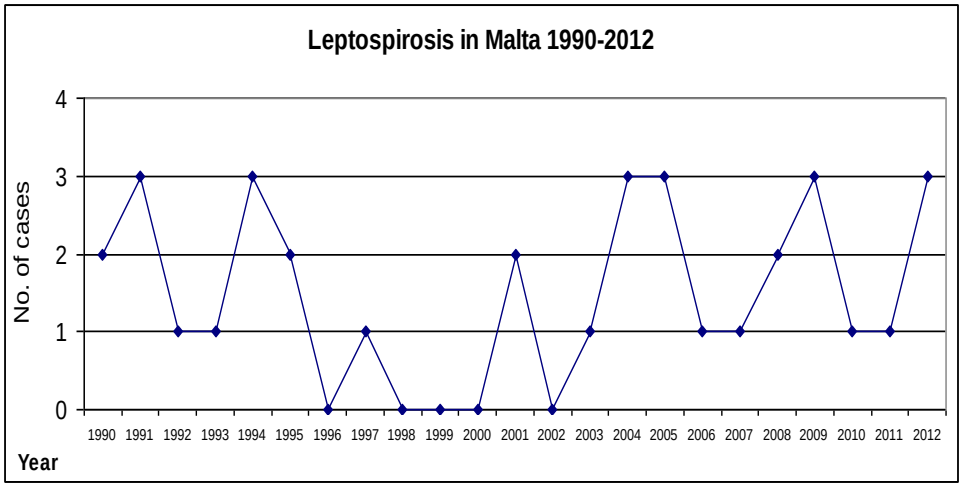
It is mostly a disease related to occupational risks such as sewer workers and veterinarians. It causes various types of symptoms but often presents with sudden high fever, headache and a flu-like illness. This may be followed by a more severe and potentially lethal condition in which meningitis, jaundice and renal failure are particularly ominous.

The majority of cases are thought to be self-limiting and often clinically unapparent infections. In 5-15% of cases progression occurs to the more severe form of the disease.

In other countries leptospirosis is a recreational hazard contracted when people swim or sport in contaminated fresh waters most especially after periods of flooding.

The mortality rate is usually high because of the dramatic nature and quick deterioration in the condition of those affected. The infection is often wrongly diagnosed due to the wide range of symptoms. In Malta the usual frequency of cases is between 1-3 cases per year (Figure 27).

Figure 27: Reported cases of Leptospirosis, Malta, 1990-2012



Deaths from Leptospirosis in Malta are equally likely (in the period 2007-2012 two persons out of five cases died – 40% of the cases) and public health action for each notification involves a thorough history of the case followed by control of rats whenever indicated. Though uncommon it remains a serious disease with a high mortality rate unless it is treated early and adequately. Surveillance therefore needs to be maintained while it is also a reportable disease to ECDC.

Hepatitis B

Hepatitis B is a liver infection caused by the hepatitis B virus (HBV). It is a major global health problem. It can cause chronic liver disease and chronic infection and puts people at high risk of death from cirrhosis of the liver and liver cancer. More than 240 million people worldwide have chronic liver infections (WHO, 2013).About 600, 000 people die every year due to the acute or chronic consequences of hepatitis B (WHO, 2013). A vaccine against hepatitis B has been available since 1982. Hepatitis B vaccine is 95% effective in preventing infection and its chronic consequences, and was the first vaccine against a major human cancer.

The WHO has categorised countries based on the prevalence of Hepatitis B surface antigen (HBsAg) into high (>8%), intermediate (2%-8%) and low (< 2%). High prevalence countries include sub Saharan Africa, most of Asia and the Pacific Islands. Low prevalence countries include most of Western Europe and North America.

The importance of the various modes of transmission varies according to the prevalence in a particular country. In high endemic countries, infection is acquired predominantly in childhood either by perinatal transmission or by horizontal transmission in early childhood. In low prevalence countries, most infections are acquired in adulthood, where sexual transmission or sharing blood-contaminated needles by injecting drug users accounts for a significant proportion of new infections.

Interpretation of hepatitis B data in Malta is difficult because of gross under notification and inability from the routine tests performed to distinguish between acute and chronic cases according to EU definitions. Hence surveillance data cannot as yet be used to describe the true incidence or trends of the disease. In a study held in 2002 (Khamis A., Barbara C, 2002), prevalence estimates of Hepatitis B for the Maltese population gave an overall true proportion of 0.032% and 1.86%. Hence Malta is considered as a low endemic country (<2%). Table 5 shows the prevalence estimates of Hepatitis B according to age groups in Malta.

Table 5: Prevalence of Hepatitis B by age group, Malta, 2002

Age Group (years)	Prevalence	95% CI
0-25	0.4%	0-1
25-50	1.9%	0.2-3.4
>50	0.5%	0-15

Source: (Khamis A., Barbara C., 2002)

Furthermore, the prevalence for Hepatitis B is lower in the younger age group (0-9 years) as compared to the older age groups. The reason is the universal vaccination policy for schoolchildren. Young adults exhibit the highest prevalence for hepatitis B as compared to other age groups. This compares with other EU/EEA/EFTA where overall the most affected (49% of cases) were those in the 25-44 year age group in 2009.

Risks of HBV infection

The risk of progression to chronic infection is related inversely to age at the time of infection. HBV infection becomes chronic in >90% of infants, about 25-50% of children aged 1-5 years and < 5% of older children and adults (Edmunds WJ et al, 1993; Medley GF et al, 1993; McMahon BJ et al, 1985; Hyams KC. 1995).

Chronic HBV infection may lead to chronic hepatitis, cirrhosis of the liver and hepatocellular carcinoma. Studies showed that about 25% of HBV infected infants and young children and 15% of those infected at an older age died of cirrhosis or liver cancer (Mast EE, Ward JW, 2008).

Hepatitis C

Hepatitis C is a liver disease caused by the hepatitis C virus (HCV). It varies in severity from a mild illness lasting a few weeks to a serious, lifelong condition that can lead to cirrhosis of the liver or liver cancer. Every year, 3–4 million people are infected with the hepatitis C virus. Worldwide about 150 million people are chronically infected and at risk of developing liver cirrhosis and/or liver cancer. More than 350 000 people die from hepatitis C-related liver diseases every year (WHO, 2013). There is currently no vaccine for hepatitis C. Anti-viral treatment is available however treatment success depends on which type of HCV virus the patient has and how long they have had the infection.

Interpretation of hepatitis C data in Malta is difficult because of gross under reporting and inability from the routine tests performed to distinguish between acute and chronic cases according to EU definitions. Hence surveillance data cannot as yet be used to describe the true incidence or trends of the disease. A study performed in 1994, to establish the prevalence for Hepatitis C virus in Maltese injecting drug users attending a treatment facility found that 55.6% of the participants tested for anti-HCV were positive (Camilleri M, 1994).

A report on the prevention of Hepatitis C in Malta was drawn up in 1994 (Prevention of Hepatitis C: a policy for Malta. D. Falzon MSc Dissertation 1994) and the following findings were outlined:

- Most known hepatitis C cases had followed transfusions of blood or blood products or had exposure through sharing in intravenous drug use. Sporadic cases with no evident risk factors may have been infected by non-sterile surgical instrumentation.
- A high percentage of intravenous drug users were anti-HCV positive at voluntary testing.
- High seroprevalence had also been noted in local prison mates, all amongst persons with concomitant drug problems.
- Hepatitis C seropositivity had also been noted in individuals transfused, before routine screening of blood and products started in Malta

Serious complications

About 80% of acute cases lead to chronic infection and 60-70% of chronically infected develop chronic liver disease; 5-20% develop cirrhosis and 1-5% die from cirrhosis or liver cancer (WHO, 2013).

Herpes Simplex

Herpes simplex viruses are ubiquitous, host-adapted pathogens that cause a wide variety of disease states. Two types exist: herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2). Both are closely related but differ in epidemiology. HSV-1 is traditionally associated with orofacial disease, while HSV-2 is traditionally associated with genital disease; however, lesion location is not necessarily indicative of viral type.

Up to 80% of herpes simplex infections are asymptomatic. Symptomatic infections can be characterized by significant morbidity and recurrence. In immunocompromised hosts, infections can cause life-threatening complications.

The prevalence of HSV infection worldwide has increased over the last several decades, making it a major public health concern. Prompt recognition of herpes simplex infection and early initiation of therapy are of utmost importance in the management of the disease.

HSV is well distributed worldwide. An increase in seroprevalence of antibodies to HSV-2 has been documented throughout the world (including the United States) over the last 20 years.

The most recent national health survey conducted in the United States revealed a seroprevalence of HSV-2 antibodies in 45% of blacks, 22% of Mexican-Americans, and 17% of whites. Seropositivity to antibodies to HSV-2 is more common in women (25%) than in men (17%). HSV infection occurs via inoculation of virus into susceptible mucosal surfaces (eg, oropharynx, cervix, conjunctiva) or through small cracks in the skin. The virus is inactivated readily at room temperature and by drying; hence, aerosol and fomite spread are rare. HSV-1 is transmitted chiefly by contact with infected saliva, whereas HSV-2 is transmitted sexually or from a mother's genital tract infection to her newborn. However, lesion location does not always indicate viral type.

Because of the ubiquitous and cosmopolitan nature of herpes simplex virus (HSV), avoiding contact with individuals who (often asymptomatically) are excreting the virus in saliva or genital secretions is difficult. Daily antiviral therapy can be given to reduce episodes of asymptomatic genital shedding and to further reduce the risk of transmission; however, it is unclear how long this should be administered.
Although not easily applicable to oral-oral contact, barrier protection using latex condoms is recommended to minimize exposure to genital HSV infections.
Because HSV genital ulcers may occur outside of areas covered by the condom, transmission can occur in those areas.

Influenza

Influenza viruses have a particular ability to change. Gradually, every year changes occur that enable influenza viruses to cause annual cycles of infection. However, from time to time, a more dramatic change occurs when one strain of the virus incorporates genetic material from another, creating a new strain with the potential to

cause widespread illness in an unprepared population. Worldwide pandemics of influenza occurred in 1918-19, 1957-58, and 1968-69. The first of these pandemics, the Spanish Flu, killed more people than died during the whole of the First World War In Malta in the 1999-2000 seasons, an attempt was made to study the influenza season in Malta through epidemiological and virological means via a joint effort of a team of three private GP's. Influenza A antibodies were elevated in more that one third of the patients tested during this surveillance. (Falzon D. et al. 2000).

The last pandemic was declared on 11th June 2009 by WHO that raised the pandemic alert level to 6, after verification of sustained community outbreaks of Influenza A/H1N1 in 2 WHO regions. A committee was set up to plan in relation to influenza pandemic preparation in Malta.

Following the last pandemic a number of general practitioners volunteered as sentinel sites for notifying cases of influenza seen in their practice. A standardised form to collect clinical data is provided to these general practitioners. This form allows the reporting of the number of cases of Influenza Like Illness seen at the practice. The reports from the GPs are collected weekly, analysed at IDCU, the surveillance co-ordination centre. The data shows a positivity rate of 1.67% at population level.

Legionnaire's Disease

Technology has an impact on infectious diseases. Appliances such as air conditioners are beneficial and part and parcel of today's modern technology but may carry risks to health. The organism, *Legionella pneumophila*, is known to cause Legionnaires' disease. The earliest documented case was in 1947 and the first documented outbreak was in Minnesota, USA in 1957.

In Malta we have seen a number of cases of Legionnaires' disease diagnosed and confirmed by urinary antigen testing over the past few years. This showed an increasing trend over the years (Figure 28,29) To counter this, a Code of Practice prepared by the Environmental Health Unit, was distributed to all hotels and establishments and a number of Legal Notices were issued. This has lead to an increased awareness in persons working in the hospitality industry with improved control of Legionella in these establishments. Of interest has been the increase in the number of household cases seen, possibly partly due to increased awareness of the condition by hospital doctors. Travel associated cases, associated with local hotels or other establishments are also reported, but in the vast majority of cases, the establishment is not implicated due to the negative results for Legionella.

The Public Health Laboratory at Evans Labs in Valletta is fully accredited as a National Laboratory for Legionella.

Figure 28: Number of notified cases of legionnaire's disease, Malta, 1990-2012

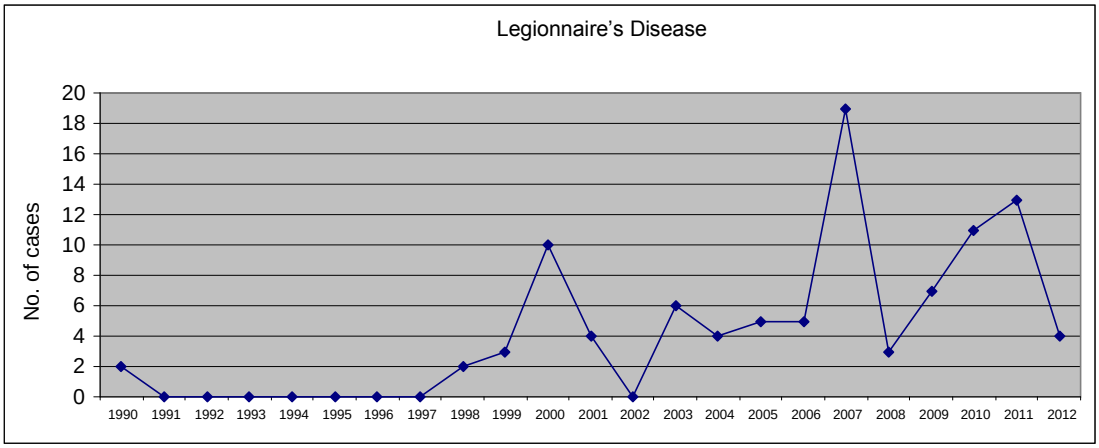
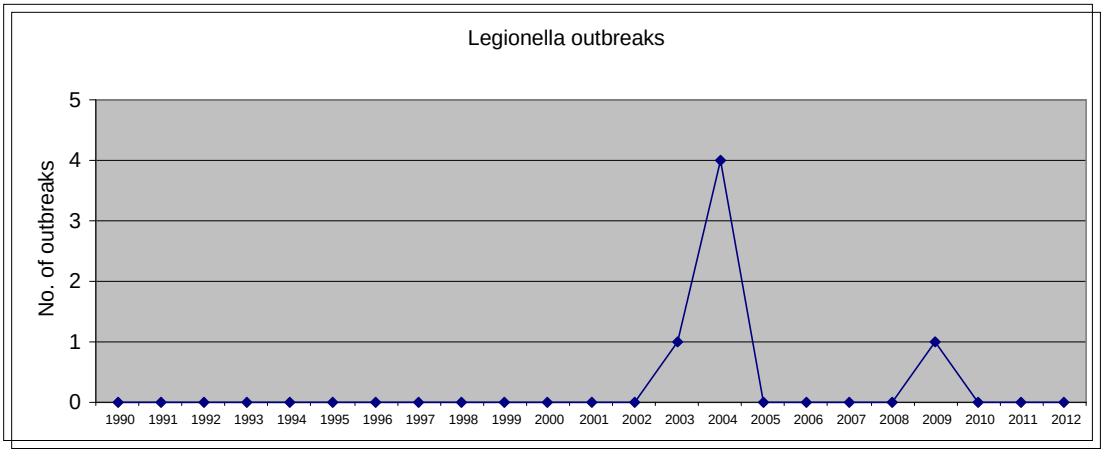


Figure 29: Number of notified outbreaks of legionnaire's disease, Malta, 1990-2012



Although the incidence rate is low, constant vigilance in this disease is required since the condition may adversely affect tourism in Malta, which is the main source of income during the summer season.

There needs to be stringent health and safety regulations to minimise the risk to human health from *Legionella* contaminated water systems. In the Code of Practice for prevention of Legionnaire's Disease in hotels and other establishments issued by The Health Division in March 1999, all types of water systems need to be considered including:

- Hot and cold systems -tanks, pipes, showers
- Air-conditioning cooling towers
- Evaporative condensers
- Humidifiers
- Whirlpool spas
- Decorative fountains

Legal backing for control of Legionella is important and the following Legal Notices are important tools :

LN 6 of 2006 - Registration of Cooling Towers and Evaporative Condensers Regulations, 2006.
LN 5 of 2005 – Control of Legionella Regulations, 2006
LN262 of 2006 – Control of Legionella (Amendment) Regulations, 2006.

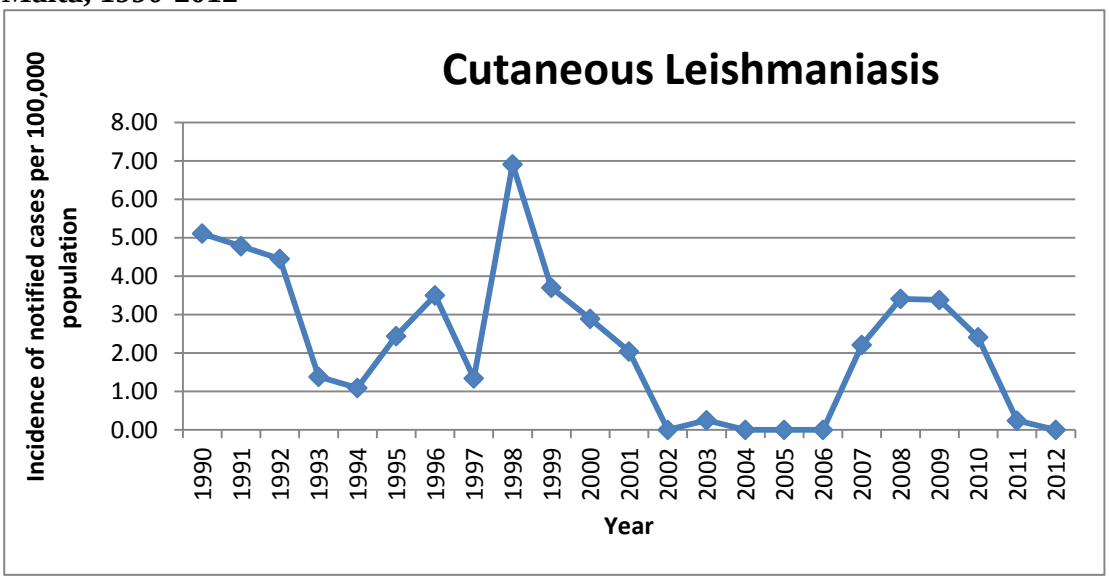
Leishmaniasis

Leishmaniasis, a neglected disease, is rare in some countries of Europe, but endemic in others, having a great impact on individuals and the potential to spread further.

Cutaneous Leishmania

In Malta, the reported incidence of cutaneous leishmaniasis peaked in 1998 when 26 cases were reported having an incidence of 6.91 per 100, 000 population. Of these 26 cases, 13 cases originated in Gozo. After this time the reported incidence was on the decline until 2007 when it increased again. No cases were reported in 2012 (Figure 30).

Figure 30: Reported incidence of sporadic cases of cutaneous leishmaniasis, Malta, 1990-2012

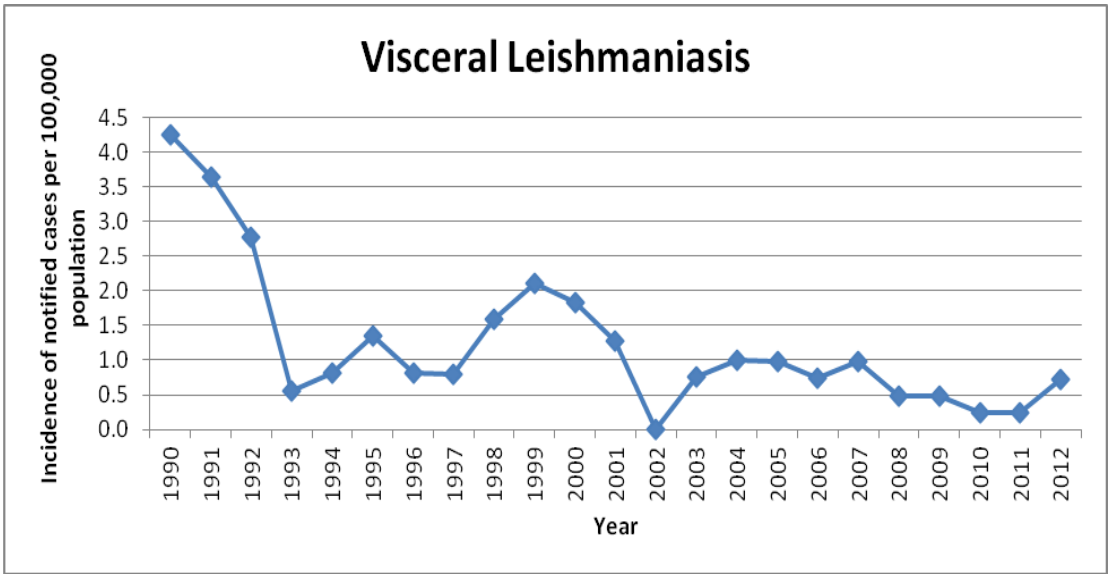


Cutaneous leishmaniasis is primarily a disease of the young, the vast majority of patients being children 2-6 years of age at diagnosis. During the period February 1982 and February 1985, 13 cases of primary cutaneous leishmaniasis were diagnosed and localised to a small coastal area of Gozo in the villages of Qala, Nadur and Għajnsielem. (Briffa V,1985)

Visceral Leishmania

The reported incidence rate of notified cases of visceral leishmaniasis has been low over the past 20 years (Figure 31)

Figure 31: Reported incidence of cases of sporadic visceral leishmaniasis, Malta, 1990-2012



There is a clear association between the prevalence of the infection in dogs and man. In the Maltese Islands, the domestic dog is the only reservoir of infection and there is no evidence that other mammals such as rats are involved (Fenech FF, 1997). In a door-to-door survey of dogs residing in 5 villages in Gozo, prevalence of canine leishmaniasis was estimated at 18.5% (Amato Gauci AJ, 1990).

Control of leishmaniasis is important since it is a condition for which effective control of leishmaniasis should be possible by

- early diagnosis and treatment of infection in local dogs
- educational measures to the public to avoid sand fly infested areas
- educational measures to avoid sand fly bites e.g. use of repellent skin lotion
- elimination of breeding places for sand flies
- appropriate use of insecticides

Leprosy/Hansen's disease

Leprosy is a disease that has been known since biblical times. It causes skin sores, nerve damage, and muscle weakness that gets worse over time.

Leprosy is caused by the bacterium *Mycobacterium leprae*. It is not very contagious and it has a long incubation period which makes it hard to know where or when someone caught the disease. Children are more likely than adults to get the disease. Leprosy has two common forms: tuberculoid and lepromatous. Both forms produce sores on the skin. However, the lepromatous form is most severe. It causes large nodules.
Leprosy is common in many countries worldwide, and in temperate, tropical, and subtropical climates. About 100 cases per year are diagnosed in the United States. Most cases are in the South, California, Hawaii, and U.S. islands.

The World Health Organization puts the number of identified leprosy cases in the world at about 600,000 as of the early 2000s. Seventy percent of all cases are found in just three countries: India, Indonesia, and Myanamar (Burma). The infection can be acquired, however, in the Western Hemisphere as well. There are about 5000 reported

cases in the United States as of 2004, almost all of which involve immigrants from developing countries. Cases also occur in some areas of the Caribbean.

By early diagnosis and appropriate treatment of infected individuals, even a disease as ancient as leprosy can be controlled. People who are in immediate contact with the leprosy patient should be tested for leprosy. Annual examinations should also be conducted on these people for a period of five years following their last contact with an infectious patient. Some physicians have advocated dapsone treatment for people in close household contact with leprosy patients.

The WHO Action Program for the Elimination of Leprosy adopted a resolution calling for the elimination of leprosy around the world by the year 2005. This goal is not likely to be reached, however; a computer simulation performed for WHO by a team of Dutch researchers in 2004 indicates that leprosy is likely to persist in some parts of the world until 2020, although its incidence will continue to decline.

Leprosy was well recognized in the oldest civilizations of China, Egypt, and India. The first known written reference to leprosy appeared in an Egyptian papyrus document written around 1550 BC.

In the 1970s, the first successful multidrug treatment (MDT) regimen for leprosy was developed through drug trials on the island of Malta. In 1981, The World Health Organization began recommending MDT, a combination of three drugs: dapsone, rifampicin, and clofazimine. The completion of MDT takes from 6 months to a year or even more, depending on clinical manifestations of the leprosy infection.

The last reported case in Malta was in 1992.16 years later, there was an imported case of leprosy from an irregular male migrant from Africa in 2008 and another imported case from an irregular male migrant in 2011.

Malaria

Cases of malaria are presently very rare in Malta and these are mostly reported from migrants and local travellers who have been to regions where malaria is endemic (Figure 32).

There is no valid reason to suppose that malaria can be transmitted locally since none of the malaria-carrying mosquito species (called the vectors) are known to exist in Malta. This is correct for the present time but it has not always been the case.

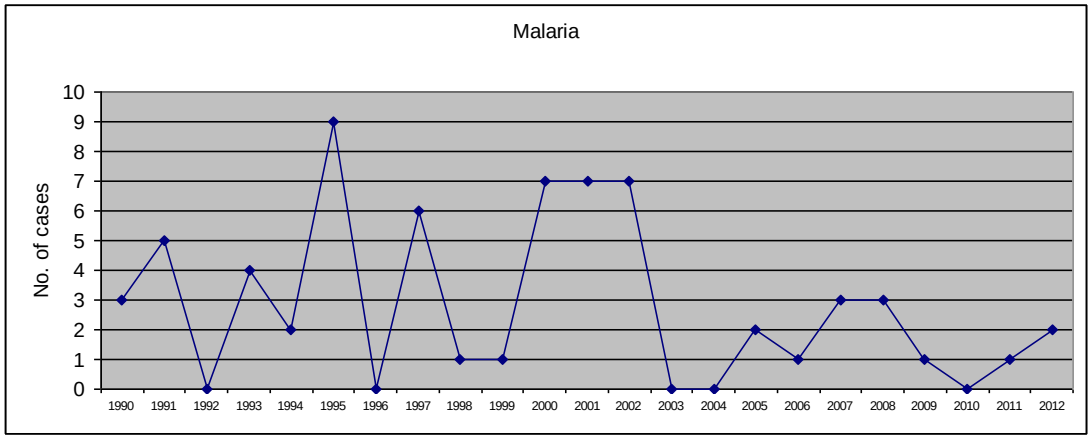
The most recent authoritative work on the mosquitoes of the Maltese Islands was that published by Dr Paul Gatt in 1996 in the Bollettino della Società Entomologica Italiana (Vol. 128 pp. 77-84). According to this work, nine species of mosquitoes have been recorded to occur in the Maltese Islands, including one species, *Anopheles maculipennis*, which is a vector of the malaria parasite.

This species was first reported by Dr Themistocles Zammit in 1905 during an investigation he made following an epidemic of malaria that broke out in 1904. However, this species that has not been reported from Malta since 1943, was not

found in the extensive field and museum studies made by Dr Paul Gatt, and there is evidence that it has been extinct from Malta for at least 48 years.

An interesting question is why has *Anopheles maculipennis* disappeared from the islands? Apparently, the chief breeding areas of this species were the marshlands in the Salina and Qalet Marku areas. These marshes were drained a long time ago so probably this species became extinct because its habitat no longer exists.

Figure 32: Number of notified cases of Malaria, Malta, 1990-2012



Meningitis

Viral Meningitis

Viral meningitis is a fairly common affection with a few cases being treated in hospital on a regular basis. This type of meningitis is not statutorily notifiable and therefore data at the national surveillance centre is not complete. Though often viral meningitis is self limiting and affected persons do not require prolonged hospitalization because of the mild nature of the illness, the diagnosis is made by testing cerebrospinal fluid whereas viral identification is rare meaning that definitive diagnosis is rare.

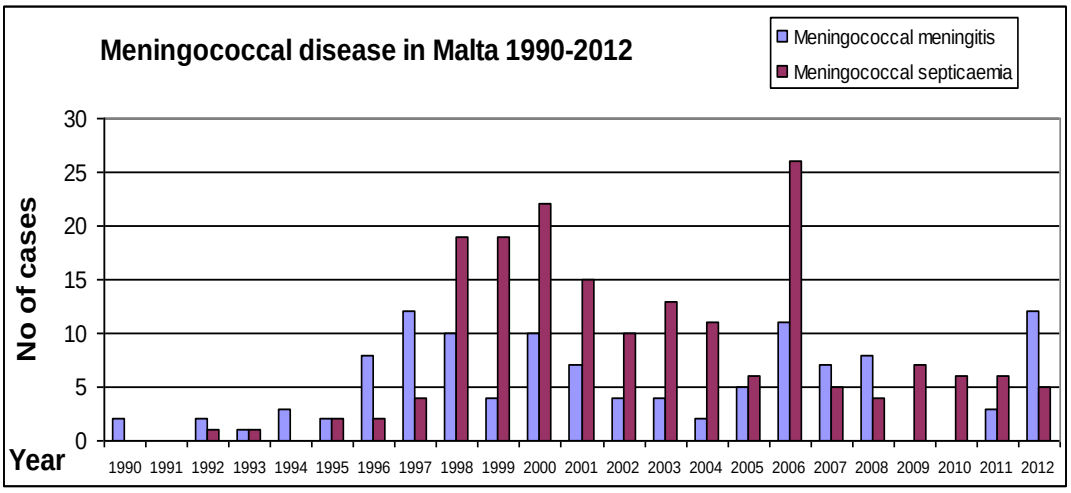
Meningococcal Disease

Meningococcal disease is caused by *Neisseria meningitidis*. Infection is usually a very rare outcome of acquisition and is usually sporadic, though the potential to cause clusters or epidemics exists. This disease is not uncommon in Malta where the national rates are above those of the EU average.

Malta has a hyper-endemic disease rate with the average rate of confirmed invasive meningococcal disease (IMD) in the period 1997-2012 being 4.1/100,000 population (range 1.5 – 9.25 cases per 100,000) [this rate includes possible (clinical diagnosis only), probable (clinical diagnosis with an epidemiological link) and confirmed cases (cases with a laboratory confirmation) as described by the ECDC definition of Commission decision 2002/253/EC of 2008. The peak incidence was reached in late nineties and during the beginning of the new millennium. 2006 marks the year where the highest number of cases of septicaemia occurred in Malta (Figure 33).

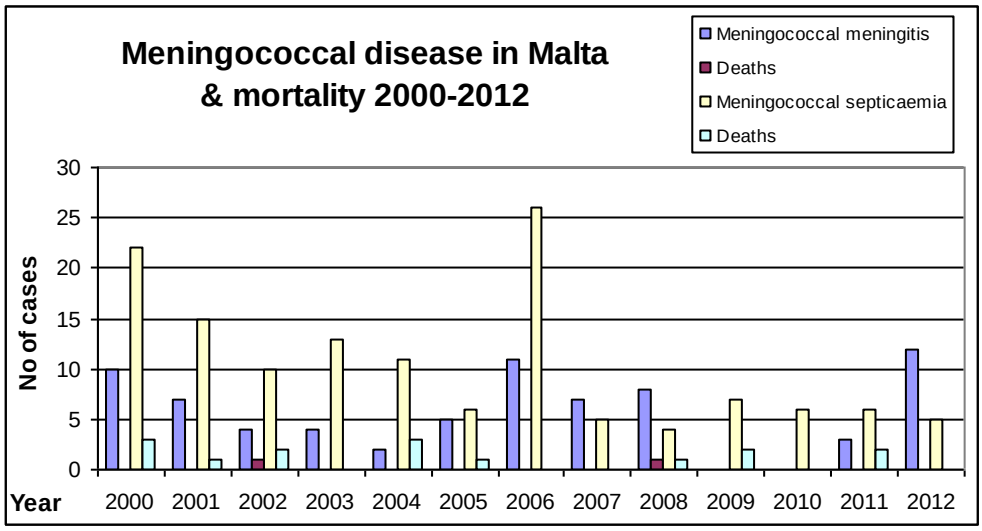
In comparison the *confirmed* cases of infectious meningococcal disease in Malta in 2010 was 0.48/100,000population whereas the overall EU notification rate was 0.73/100,000. During the same year the incidence rate (per 100,000) was highest in Ireland (2.19) and UK (1.63) and the lowest rate was in Bulgaria (0.11).

Figure 33:Number of notified cases of meningococcal disease, Malta, 1990-2012



Septicaemia is the commonest form of meningococcal disease in Malta with an average of 11.25 cases/year between1997-2012 (range 4-26 cases/year) compared to cases affected with meningitis (average 6.2, range 0-12). Similarly the there was only one reported death from meningococcal meningitis in the 13 year period 2000-2012 while 11 deaths were recorded from septicaemia during this period (Figure 34). Septicaemia mode of meningococcal disease remains the highest cause of mortality with a calculated case fatality rate of 7.28% in Malta within the same period of time. (Description includes possible, probable and confirmed cases).

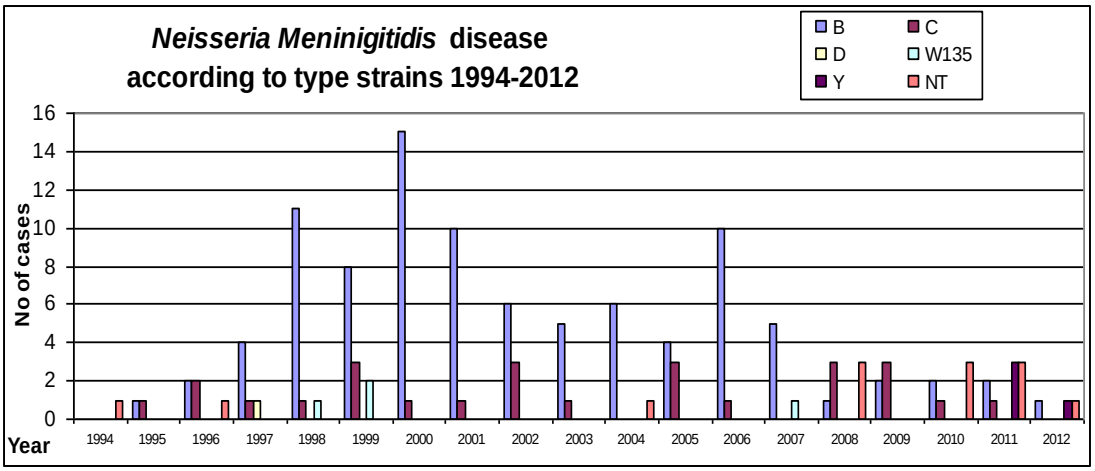
Figure 34: Mortality from meningococcal disease by type of manifestation, Malta, 2000-2012



Meningococcal disease caused by type B has been the most frequent type (>66% of all confirmed cases) that has caused human disease in Malta since 1994. *Neisseria meningitidis*

type C has caused disease in more than 18% of laboratory confirmed cases while for the first time three cases of type Y have been identified in 2011 (Figure 35).

Figure 35: Laboratory confirmed cases *Neisseria meningitidis* by serotype, Malta, 1994-2012.



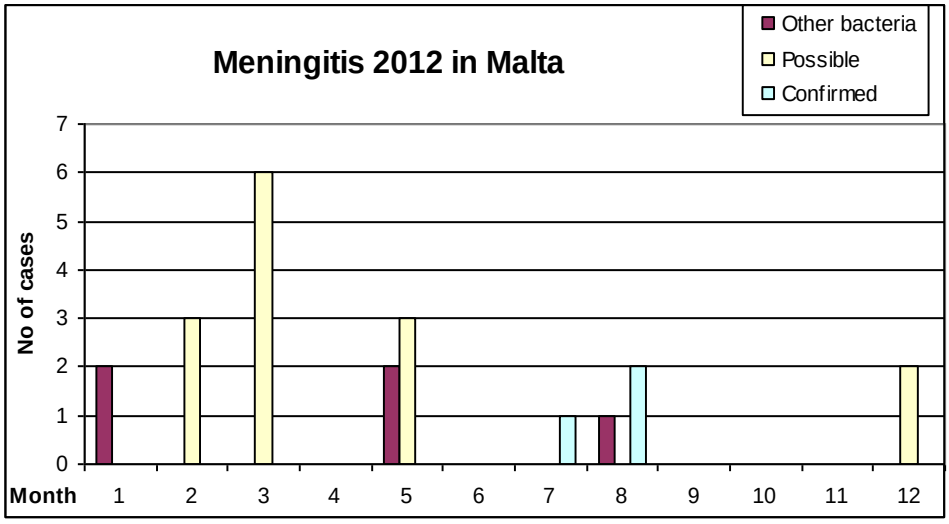
Meningococcal disease is a public health priority disease all over the world where most cases are sporadic but outbreaks having been described. Outbreaks or epidemiologically linked cases having not been described locally, though the potential for this manifestation exists. Public health action includes a thorough history of each case, contact evaluation and prophylactic treatment for those considered at risk. The infection is one that causes a substantial amount of apprehension amongst the public and parents as well as media interest because of its dramatic nature and the potential for morbidity and mortality.

Meningitis caused by other bacteria

Meningitis caused by bacteria other then meningococci is fairly common in Malta. Taking 2012 as an example there were 5 cases of reported meningitis cases that were confirmed to have been caused by bacteria other then meningococcal disease. Two cases in newborns were caused by Group B Streptococcal (GBS) bacteria as described under the β-Haemolytic Streptococci infections above. Two cases were caused by *Haemophilus influenzae* and both cases were above 65 years of age. Another case was caused by capsulated *Streptococcus pneumoniae* in a 66 yr old lady.

These infections though not common may have Public Health significance because of the potential mortality associated with such severe illness that can elicit public anxiety as well as the potential for some pathogens to cause outbreaks as exemplified by the two GBS cases as described above where one case died.

Figure 36: Number of reported cases of bacterial meningitis, confirmed meningococcal and possible meningococcal, Malta, 2012.



New and Emerging Diseases

Emerging infections may be:

- a recognised infection spreading to new areas or populations
- the result of discovering that a known disease is caused by infection
- a previously unrecognised infection appearing in areas where the habitat is changing (e.g. deforestation)
- a new infection resulting from change(s) in existing microorganisms
- an "old" infection re-emerging because it has become resistant to treatment, or as a result of a breakdown in public health initiatives

The threat of apparently new or previously unrecognised infection is ever present. Over the past 25 years more than 30 new or newly- recognised infections have been identified around the world. The pattern of known infections also changes constantly, as the areas where disease is constantly present expand beyond traditional limits. Some examples are included in Table 6.

Table 6: New or emerging diseases worldwide, 1970-2012.

1976	Cryptosporidium parvum Legionnaire's disease Ebola
1977	Campylobacter jejuni
1980	Human T-lymphotropic virus
1982	Escheriscia coli 0157:H7
1983	HIV
1988	Hepatitis E Human herpesvirus 6
1989	Hepatitis C
1991	Guanarito virus
1992	Vibrio cholerae 0139

1993	Hantavirus pulmonary syndrome
1994	Sabia Virus Hendra virus
1995	HHV8 (Kaposi sarcoma virus)
1996	New variant Creutzfelt-Jacob Disease (nvCJD) Australian bat lyssavirus
1997	H5N1 (Avian Flu)
1999	Nipah Virus West Nile Virus
2003	Severe acute respiratory syndrome (SARS)
2004	Simian Foamy Retroviruses
2005	Human retroviruses HTLV3, HTLV4, Human Bocavirus
2008	Novel Lujovirus in Southern Africa
2009	Pandemic H1N1 Influenza A virus
2012	Novel Influenza A N7H9 Novel coronavirus

Modern demographic and environmental conditions that favour the spread of infectious disease include

- Global travel
- Globalisation of the food supplies and centralised processing of food
- Population growth increased urbanisation and crowding
- Population movements due to civil wars, famines, and other man made or natural disasters
- Irrigation, deforestation, and reforestation projects that alter the habitats of disease-carrying insects and animals
- Human behaviours, such as intravenous drug use and other risk behaviour
- Increased use of antimicrobial agents and pesticides, hastening the development of resistance
- Increased human contact with tropical rain forests and other wilderness habitats that are reservoirs for insects and animals. These harbour unknown infectious agents
- Under-investment in or complacent attitudes to public health control measures for communicable diseases e.g. interruption of effective vaccination programmes

Given the nature of the micro-organisms that cause infection, the pattern of human behaviour and changes to the environment, further newly emergent infectious diseases are inevitable. Infectious disease in another part of the world must be assessed as a potential threat to Malta.

The re-introduction of exotic diseases to Malta is another source of emerging infections. Examples of such diseases include typhoid and dengue fever. A high proportion of such diseases are linked to returning travellers.

The emergence of bio-terrorism as a potential threat is another route by which new diseases could be introduced. A number of agents that may be used include anthrax, botulism, bubonic plague, smallpox and tularaemia. These agents, together with those

responsible for the viral haemorrhagic fevers, are considered to be the highest priority group because

- they can easily be disseminated or transmitted from person to person
- they cause high mortality
- they have potential for major public health impact
- they might cause public panic and social disruption
- they require special action for public health preparedness

Rotavirus

This infection is commonest in children. The incidence of rotavirus gastroenteritis has been monitored in the Gasthuisberg University Hospital (GUH), Belgium since 1986, and since 1999 the genotypes of circulating rotavirus strains have been determined. The average percentage of rotavirus positive cases out of all hospitalized gastro-enteritis cases tested (>95% of these cases were younger than 5 years old) at the GUH between 1986 and 2006 was 19.0%. (Zeller M et al, 2010)

Rotavirus is not a notifiable disease; however it is well known that admissions in children's wards from gastroenteritis are common and a considerable proportion of these due to this viral pathogen. In 2012 a number of stools samples were analysed for rotavirus antigen in this clinical context. 49% of the patients were females, 50% were males and the rest were unidentified. Only 10% of the tests were positive for rotavirus antigen, the majority (88%) were negative and a few were either indeterminate or the sample was soiled/not labelled. Most patients testing positive for rotavirus antigen were under 10 years of age.

Scabies

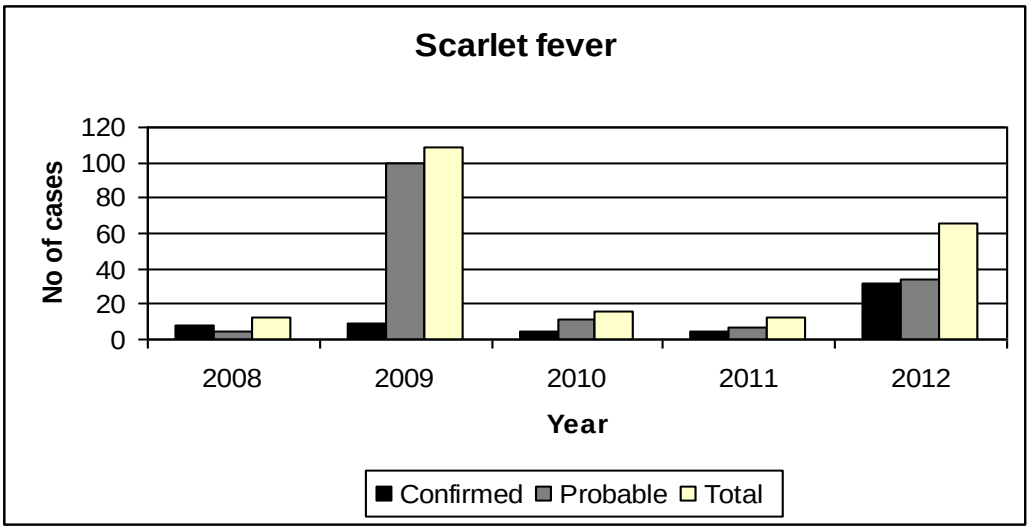
Scabies is a skin infestation by the human mite (*Sacroptes scabiei var. hominis*). This microscopic mite burrows in the upper layer of the skin where it lives and breeds. It is spread by direct prolonged skin to skin contact with a person with scabies. It occurs worldwide and affects all races and social classes. It is spread rapidly in crowded conditions where there is frequent body contact like nursing homes, prisons and other institutions.
Although scabies is not a notifiable disease in Malta, it is of public health importance to control the spread of the disease. A large amount of cases are reported to IDCU each year. Between the years 2005 and 2012, there were two large outbreaks, one involving a mental care facility (2011-2012) and the other involving an old people's home (2011), followed by several small outbreaks. Other smaller outbreaks also occurred in other old people's homes and detention centred for irregular migrants.

Scarlet Fever

Scarlet fever is a bacterial infection caused by erythrogenic toxin producing B haemolytic, Group A *Streptococcus pyogenes*. It usually affects children between 5-12 years of age although anyone can be affected. It may follow a streptococcal throat infection or less commonly a streptococcal skin infection. The illness is usually mild but needs to be treated with antibiotics to prevent rare but serious complications.

Antibiotic treatment also helps to clear up the symptoms faster thus reducing transmission to other children.
Complications of scarlet fever include: rheumatic fever, post streptococcal glomerulonephritis, otitis media, skin infections, pneumonia and arthritis.
Notification of scarlet fever is incomplete however cases are supplemented by cases identified during investigation Figure 37).

Figure 37: Number of notified cases of scarlet fever, Malta, 2008-2012



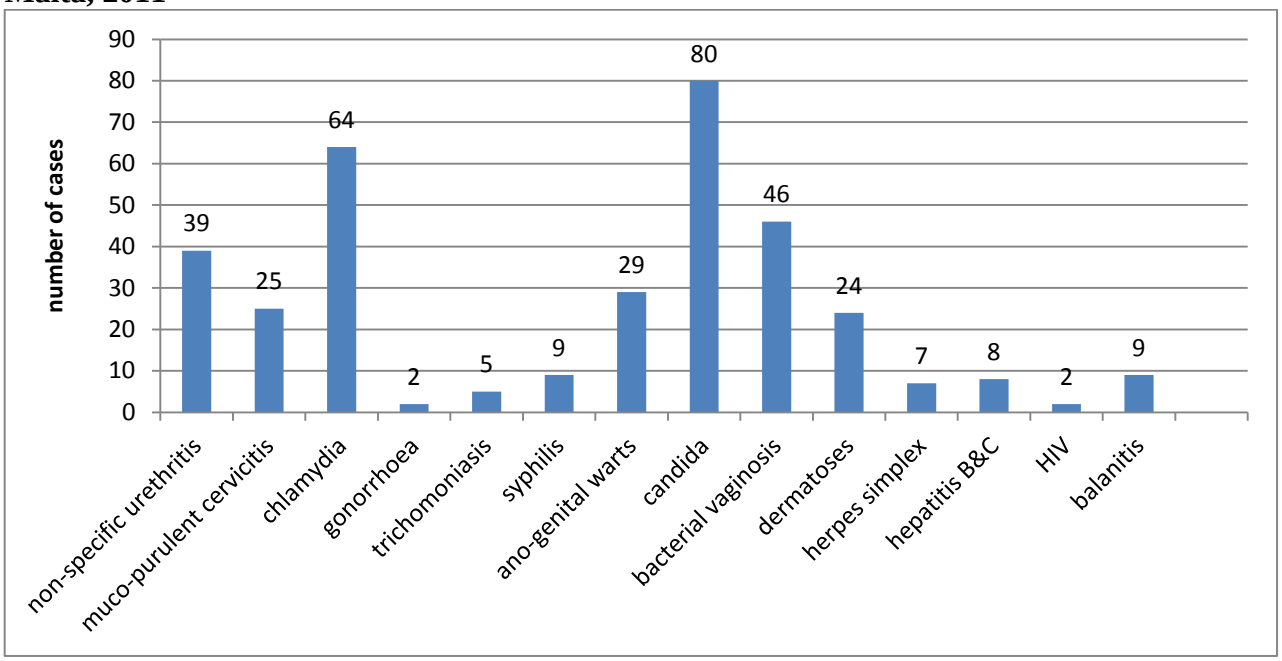
Sexually Transmitted Infections

Accurate reporting of sexually transmitted infections (STIs) remains a problem, mainly due to the persistent stigma surrounding them.
In Malta cases of sexually transmitted diseases are mainly notified by the Genitourinary Clinic (GU). However the majority of patients are still seen by GPs and also at the Gynaecology Department but the vast majority of these cases are not notified. Hence the statistics available on STIs are only the tip of the iceberg. The most common types of infections seen are Canidasis and Chlamydia (Figure 35).

The GU clinic had a total of 2462 attendances in 2011, most of which, 77% 1902 (77%), were new cases. Of those attending 61% were male and 39% were female. The main method of referral is self-referral, which accounted for 83.5% of all referrals. Twelve percent were referred by other physicians and 4.5% were referred by other agencies mainly Caritas. An important note is that 335 (17.6%) were non-Maltese, including regular and irregular migrants and tourists.

Thirty-one percent described their partner as casual, 50% as a regular partner and 15% named their spouse as their most recent contact. The impression is that regular partnerships are often short-lived with frequent change of partners, indicating that the rate of casual sex is higher than first imagined. Condom use remains very low with no sign of change over the past years.
The combination of casual sex with poor condom use is the right atmosphere of STIs, including HIV to flourish.

Figure 38: Number of STIs by type diagnosed at the Genito-urinary clinic, Malta, 2011



Recent years have shown an increase in the total number of cases of Chlamydia, which is in keeping with the global trend.

Cases of Gonorrhoea have been rising steadily over the years with a decrease since 2010. There has been an overall reduction of 9% in cases of Gonorrhoea reported from Europe over the period 2006 - 2009 (ECDC, 2011). In 2000, the antibiotic of choice was ciprofloxacin. By 2005, when WHO recommended 5% as the threshold for changing an antibiotic, 17% of isolates were found to be resistant to it,. Treatment was changed to Ceftriaxone in 2006. Recent sensitivities (2009 -10) are not encouraging. The Gonococcus is becoming increasingly resistant to third generation cephalosporins currently considered to be first–line treatment. In keeping with the British Society for Sexual Health and HIV (BASHH) guidelines the dose of first-line treatment has been increased to 500mg from 250mg, in an attempt to delay complete resistance.

Syphilis has shown an increase in numbers in recent years, the same trend seen in all major European countries. Contact tracing in Syphilis cases diagnosed at the GU clinic is only possible in a few cases. This is due to the fact that most of the early latent, and therefore highly infectious diseases, are acquired from very casual sex with anonymous persons, often in other countries, mainly European. Those who are able to trace their contacts are reluctant to do so either because of stigma or possibly physical violence and over 90% of those with later latent disease are non-Maltese whose likely source was their home country. In these cases the language barrier is also a problem.

Key factors in STI control include:

- Enhancing surveillance to estimate the burden caused by STIs .

- Assessing and monitoring disease prevelence and trends to identify population subgroups at risk and guide funding and resource allocation.
- Assessing syndrome aetiologies.
- Monitoring antimicrobial resistance.
- Conducting further studies and research on presentation and effects of STIs (eg, inflammatory disease, ectopics, cervical cancer) and assessing health care seeking behaviour.
- Ensuring the availability of laboratory diagnostics for the identification of pathogens in clinical samples.
- Some sexually transmitted infections can lead to more serious long-term consequences that include prolonged pain and discomfort, sterility, ectopic pregnancy, liver cancer and cervical cancer.
- Human behaviour is changing.

Tuberculosis

Tuberculosis (TB) is a re-emerging infectious disease of global importance. Worldwide, TB is the second leading cause of death from communicable disease, being responsible for 1.4 million deaths in 2011. Overall, one-third of the world's population is currently infected with the TB bacillus. Sub-Saharan Africa has the highest incidence per capita (260 cases per 100,000 in 2011) but the greatest burden of disease occurs in South-East Asia (WHO, 2013).

Epidemiology of tuberculosis during the last century in industrialized countries

The incidence of TB has declined steadily in many industrialized countries during most of the last century. This decline was mainly due to: better socioeconomic conditions, nutrition, sanitation, less overcrowding, the introduction of effective chemotherapy in the 1940s and the introduction of routine adolescent BCG vaccination programmes in 1953.

During the late eighties (Jereb JA et al, 1991) and early nineties (Raviglione M C et al., 1993) this decline was disturbed in many countries. Low priority given by governments, inadequate funding together with declining scientific interest in an infectious disease that seemed no longer important in the industrialised world have led to millions of deaths in many developing countries and a return with vengeance to the richer nations (WHO, 1994). In 1993 the WHO declared TB as a Global Emergency (WHO, 1993) stating that TB was the world's most "neglected health crisis" today (WHO, 1994)

The resurgence of TB has been attributed to several factors mainly:

- Increased global migration from high incidence to low incidence countries
- Immunodeficiency secondary to HIV infection

- Development of multidrug resistance TB

Changing patterns in the epidemiology of resurgent TB

In the industrialized world TB has moved from being a disease that occurred across all parts of the population to one occurring predominantly in specific subgroups of the population which are more vulnerable. These include immigrants from high TB incidence countries, HIV-seropositive individuals, prisoners, the elderly and the household contacts of recent TB cases (Broekmans J F et al, 2002). Tackling TB in these vulnerable populations must be the key component to reduce and ultimately eliminate TB.

The epidemiology of TB in Malta

Malta is a low TB incidence country (< 20/100,000 person-years) with an average notification rate of 7.6 per 100,000 person-years, ranging from 1.8 to 12.9 per 100,000 over the last ten years. Like other Western European countries, the TB notification and incidence rates in Malta have declined steadily in recent decades. During the period 1995-2012, the TB notification rate in the Malta-born population has significantly decreased and cases occurred mostly in the elderly, mainly due to endogenous reactivation of old TB infection (Figure 39).

However, following the recent wave of irregular immigration from the African subcontinent to Malta since 2002, it was noted that an increasing number and proportion of TB cases were being detected among these immigrants. During 2002-2012, the proportion of total TB cases in Malta who were irregular African immigrants increased significantly from 33% in 2002 to 71% in 2012 (Figure 40). The TB notification rate in African migrants was 347/100,000 person-years compared to 2.7/100,000 Malta-born rate (Pace-Asciak A et al., 2012)
Furthermore during the period 1995-2012, the overall TB notification rate has also increased significantly from 2.6/100,000 to 10/100,000 person-years. This rise may be mainly due to the recent large influx of immigrants from high-prevalence countries and to the increasing proportions of immigrant TB cases as the Malta-born rate has decreased (Pace-Asciak A et al., 2012).

Figure 39: Number of tuberculosis cases by geographic origin, Malta, 1995-2012

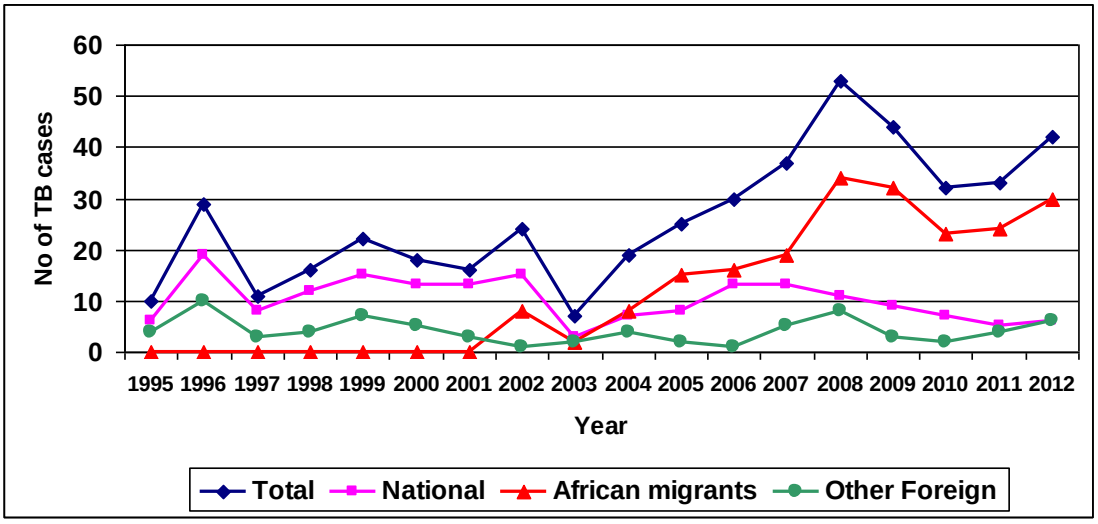
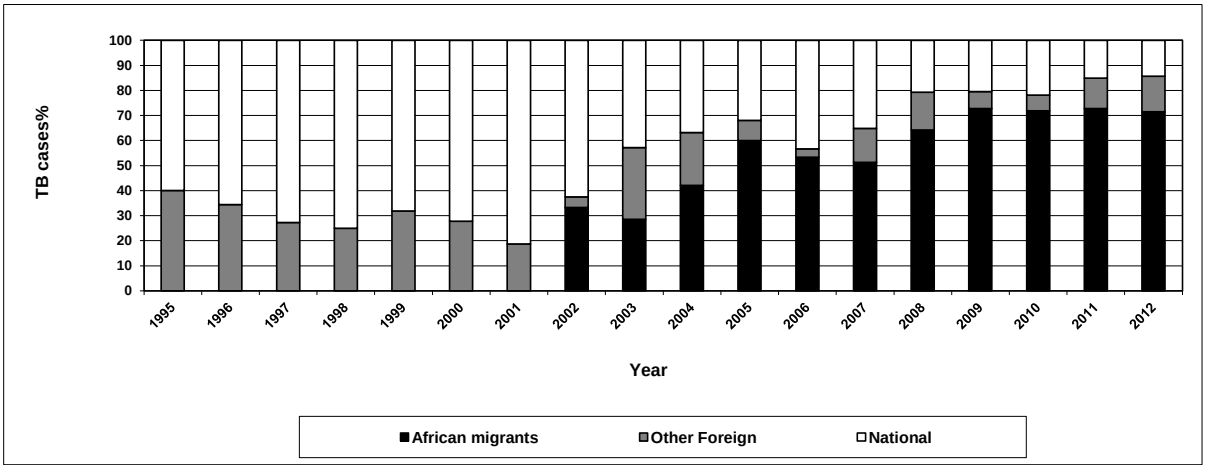


Figure 40: The proportion of tuberculosis cases by geographic origin, Malta, 1995-2012



Toxoplasmosis

Toxoplasmosis, caused by the protozoan *Toxoplasma gondii*, is acquired predominately following ingestion of raw or partly cooked meat containing toxoplasma cysts or ingestion of contaminated cat feces. In humans the oocysts release trophozoites, which migrate widely, with a predilection for eye, brain and muscle. Infection is lifelong and HIV may reactivate it. Toxoplasmosis occurs worldwide, but is common in the tropics. In the past 10 years only 8 cases of toxoplasmosis infection has been notified, It should however be noted that underreporting is likely.

Typhus

The commonest form of typhus encountered in Malta is murine typhus followed by tick-borne typhus. The number of reported cases of murine typhus are steeply declining especially during the past few years (Figure 41). The tick-borne typhus cases reported peaked in 1998 when surveillance for this condition was enhanced (Figure 42).

Figure 41: Incidence of reported sporadic cases of Murine Typhus, Malta, 1990-2012

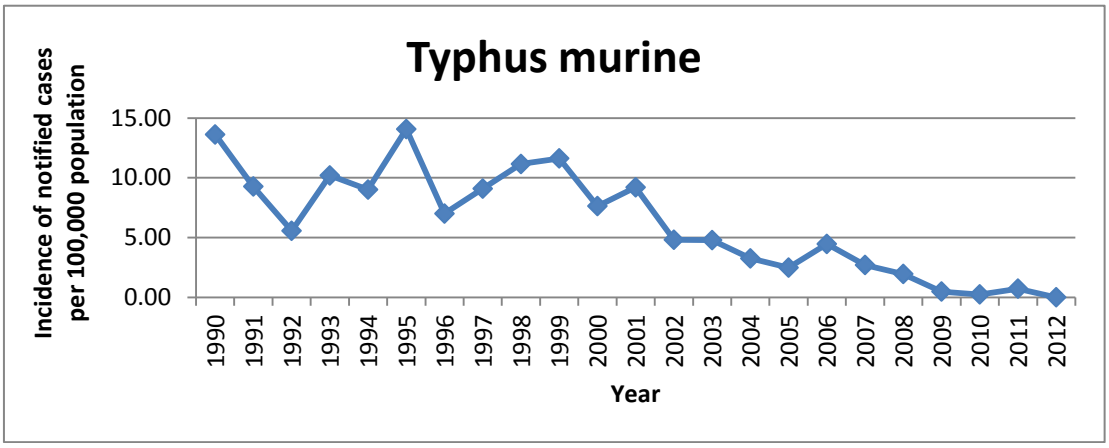
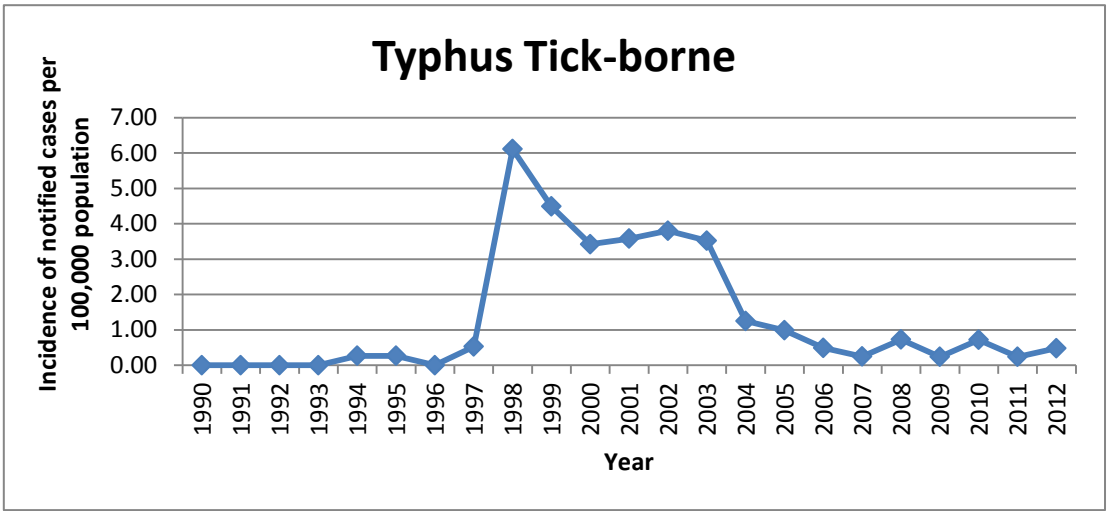


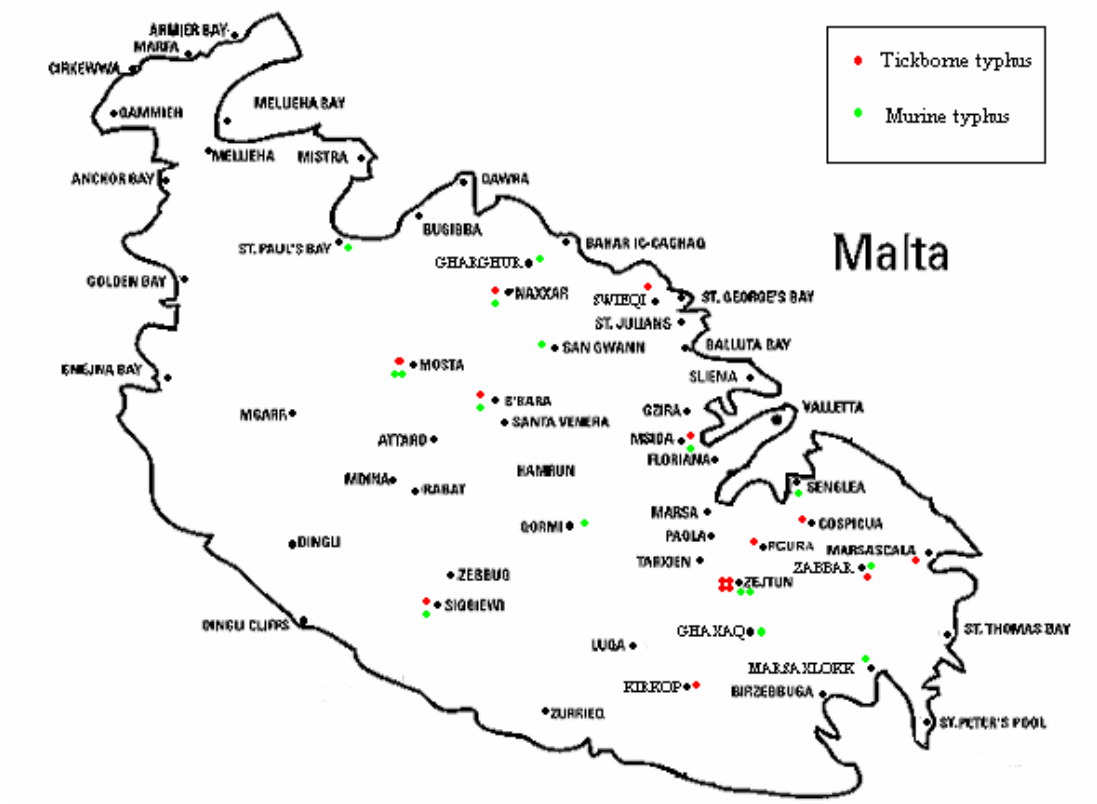
Figure 42: Reported incidence of sporadic cases of Tick-borne Typhus, Malta, 1990-2012



Till 2008 there were more cases of murine typhus notified per year than of tick-borne typhus. This trend changed since 2009, with similar numbers of tick-borne and murine typhus being reported every year. For tick-borne and murine typhus, there is greater preponderance towards male cases with a ration of 9:4 cases for tick-borne and 13:6 for murine typhus.

Figure 43 portrays the geographic distribution of cases for 2002 showing higher concentration of cases towards the South East of Malta. There were also cases in Gozo

Figure 43: Distribution of reported cases of typhus by locality, Malta, 2002



Control of typhus is important because many cases would require admission, entail substantial loss of work and treatment costs are significant. Changes in the environment especially climate change, can have profound effect on the reported incidence rate of typhus.

Key factors in the control of typhus include

- effective flea control
- elimination of rodents
- de-ticking of dogs
- control of stray dogs

Vaccine Preventable Diseases

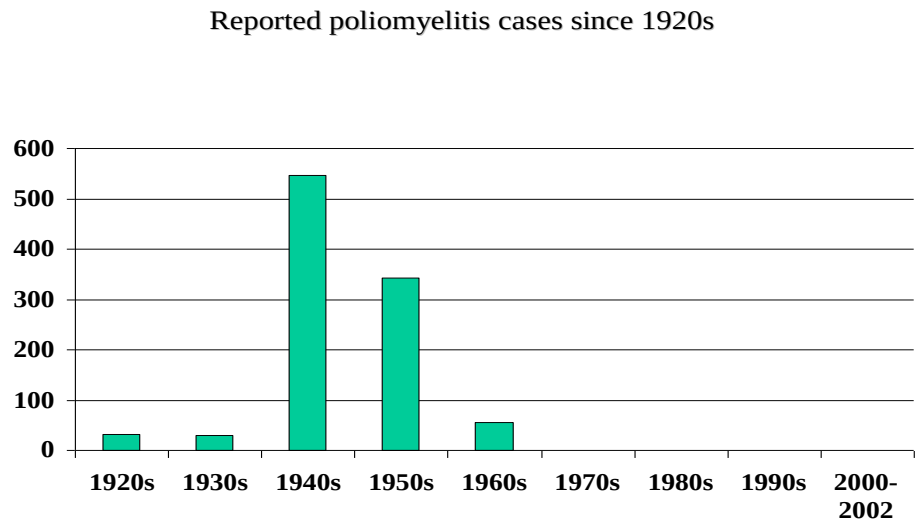
Childhood diseases such as diphtheria and polio have been virtually eliminated in Malta. Smallpox has been eradicated worldwide and polio has been declared eradicated from Europe in the year 2002. The last case of polio was diagnosed in Malta in 1964. However other vaccine preventable diseases including measles, rubella, pertussis and chicken pox continue to occur.

Polio

The WHO's eradication strategies rely on acute flaccid paralysis (AFP) surveillance as a sufficient means of detecting wild poliovirus circulation. The surveillance programme requires that AFP cases in children under 15 years of age are reported and investigated (World Health Assembly. Global Eradication of Poliomyelitis by the Year 2000. Geneva; World Health Organisation, 1988) .Active surveillance for AFP in Malta became effective in January 1998 and is still ongoing with monthly reporting to WHO.

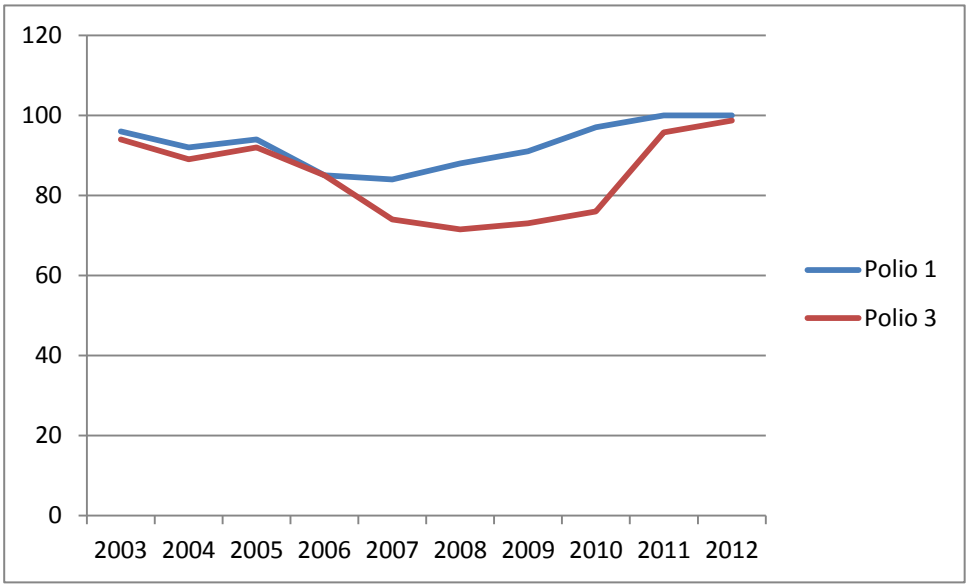
The last cases of polio seen in Malta were in the 1960's (Figure 44). No further cases were identified since then and hence along with Europe polio has been confirmed to be eradicated in Malta.

Figure 44: Number of reported cases of polio, Malta, 1920-2002



For many years Malta has maintained high oral poliovirus vaccine coverage especially in the child population, vaccination being a legal requirement, which is enforced. Herd immunity is therefore considered to be high. High coverage with three doses of poliovirus vaccine as been achieved since 1995 ranging from 94% to 96% (Figure 45).

Figure 45: Percentage vaccination coverage for polio, Malta, 2003-2012



Malta, being an island has no borders with polio-endemic countries. However a varying number of refugees and asylum seekers arrive in Malta on a yearly basis.

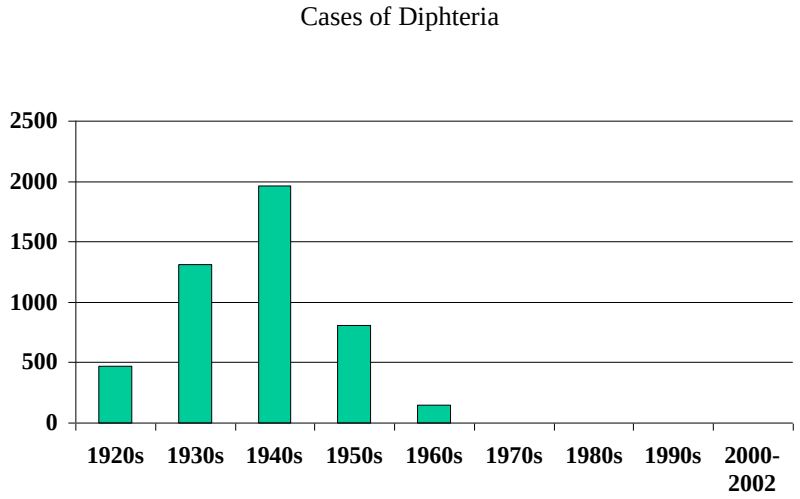
Although polio is eliminated from Malta key factors in the control and prevention of re-emergence include:

- Maintaining a high vaccination coverage
- Vaccinating travellers to high endemic countries
- Prevention of polio from persons coming from high endemic countries including tourists, refugees and persons coming to work in Malta.
- Constant surveillance

Diphtheria

The number of cases of diphtheria in Malta has declined with no cases being reported after the 1960's (Figure 46). This reduction is due to the high herd immunity in the population. High coverage with three doses of diphtheria vaccine has been achieved since 1995 ranging from 94% to 96%.

Figure 46: Number of reported cases of diphtheria, Malta, 1920-2012



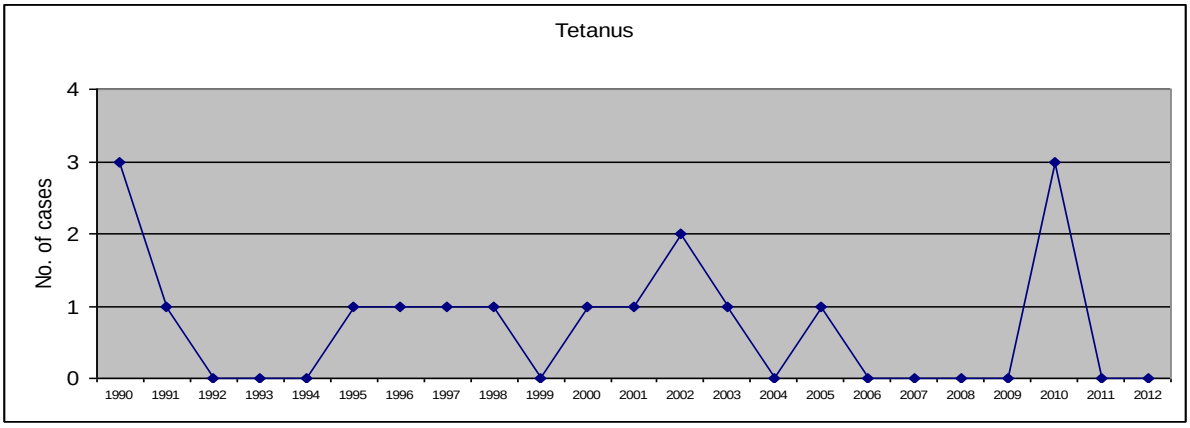
Key factors in the control and prevention of diphtheria include:

- Maintaining a high vaccination coverage
- Vaccinating travellers to high endemic countries
- Prevention of diphtheria from persons coming from high endemic countries including tourists, refugees and persons coming to work in Malta.
- Constant surveillance

Tetanus

The number of cases of tetanus has been on the decline in Malta with no cases reported between 2006 and 2012, except for 3 cases reported in 2010 (Figure 47). All of these cases (1 male, 2 females) survived.

Figure 47: Number of reported cases of tetanus, Malta, 1990-2012



It is important that:

- A high vaccination coverage is maintained to maintain herd immunity
- The general public is educated on the necessity for complete immunisation with tetanus toxoid, the hazards of puncture wounds and closed injuries and the potential need after injury for active and/or passive prophylaxis.
- Tetanus prophylaxis is provided in wound management

Pertussis

The incidence of pertussis in Malta is generally on the decline however, during 2011 an increase in the number of cases and clusters was observed. Only a cluster of two cases have been reported during 2012 (Figure 48 & Figure 49).

Figure 48: Number of reported cases of pertussis, Malta, 1990-2012

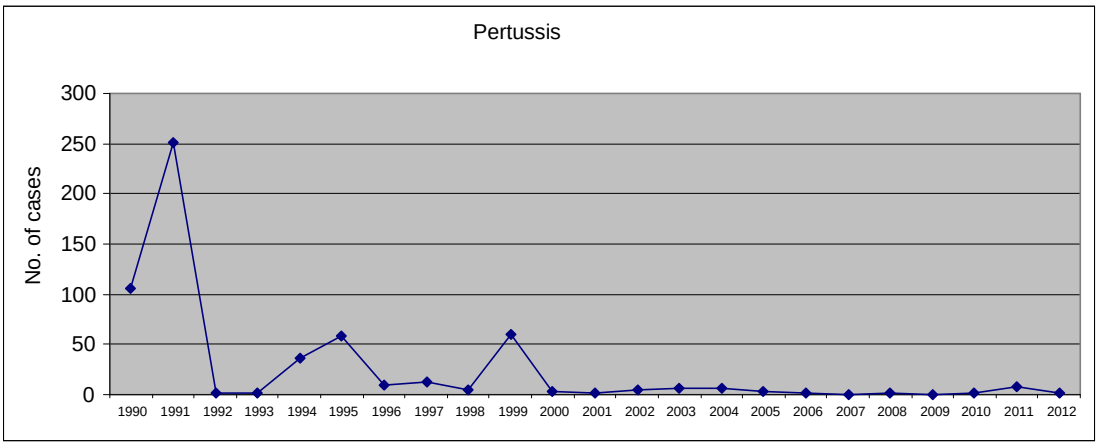
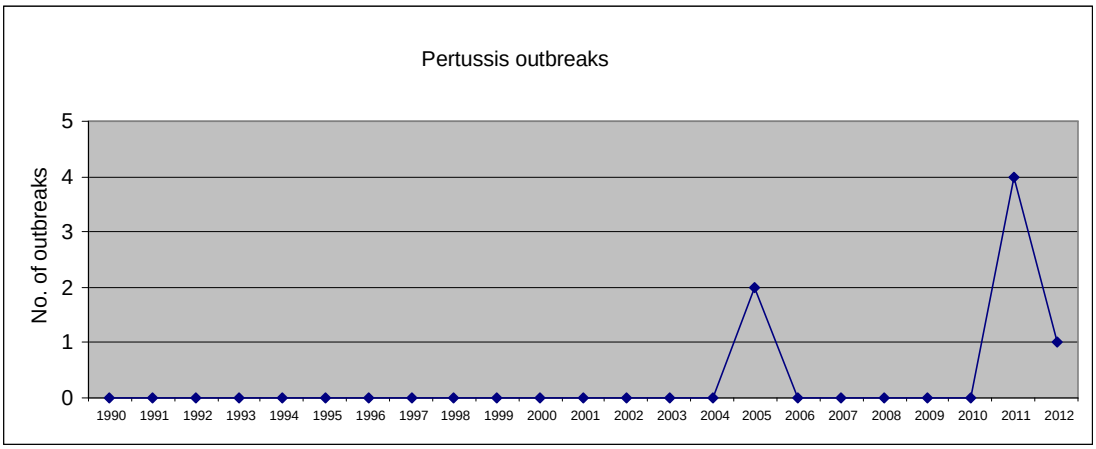


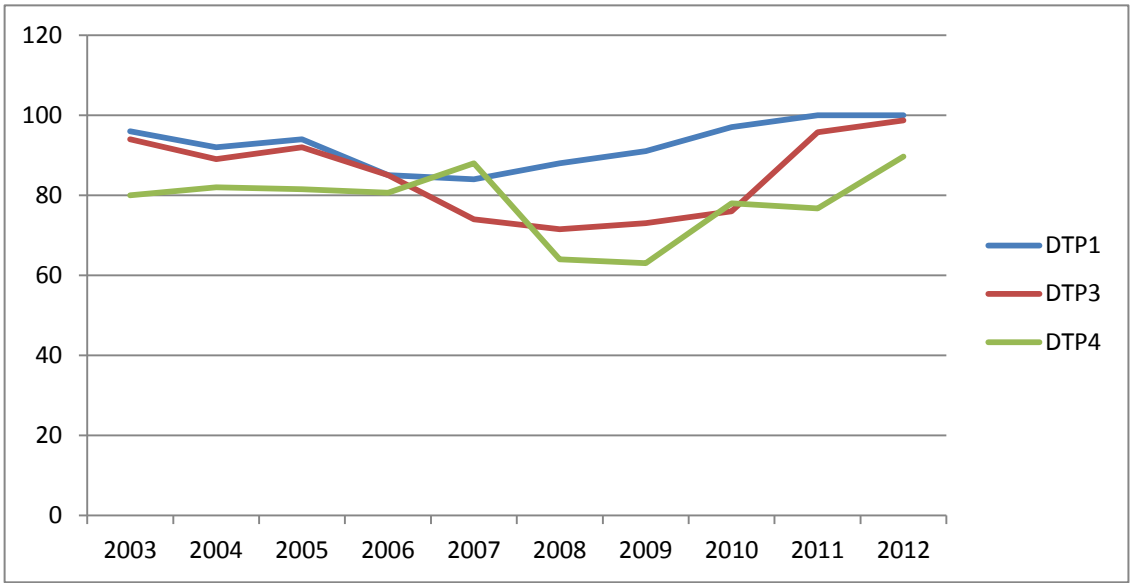
Figure 49: Number of reported outbreaks of pertussis, Malta, 1990-2012



The coverage rate for pertussis (95%) is high providing herd immunity despite the fact that vaccination against pertussis is not legally obligatory (Figure 49). The importance of maintaining high herd immunity is observed by looking at the effect of the pertussis vaccine scare in the 1970's. In England the 1974 report on pertussis vaccine neurological reactions lead to a loss of confidence in the vaccine safety with a sharp

reduction in coverage. Pertussis epidemics followed and it took several years to return the coverage rate to the pre-scare level. (Gangaosa EJ et al. 1998)

Figure 50: Percentage vaccination coverage for Diphtheria, Tetanus and Pertussis, Malta, 2003-2012



Measles

With the massive campaign carried out in 1987 to promote vaccination, there has been a marked reduction in the number of reported measles cases. In fact in 2012, there were no confirmed cases of measles.

The WHO European Region has launched a programme of improved surveillance of measles with the aim of its eradication from Europe until 2015. Malta participates in this programme with monthly reporting to WHO. Measles was also one of the priority diseases selected by the European Network for European Surveillance. The IDCU sends case based reports of all notified measles on a monthly basis to the European Surveillance Network (EUVAC.NET), which deals with the surveillance of vaccine preventable diseases. The Network collaborates with the WHO in its efforts to implement strategies for measles and rubella elimination in the European Region by 2015 (following extension of the elimination target from 2010 to 2015).

Major challenges to achieve elimination include the fact that no member state is completely free, and the increasing levels of migration of non-immune individuals from other countries. Issues for Malta to consider are addressing possible under immunisation of healthcare staff and the regular immunisation of migrants for measles and rubella.

Figure 51: Number of reported cases of measles, Malta, 1990-2012

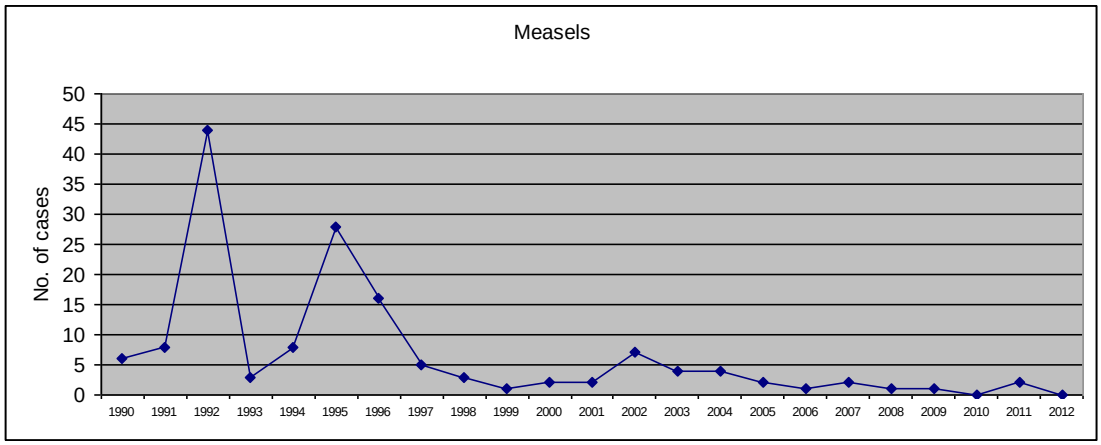
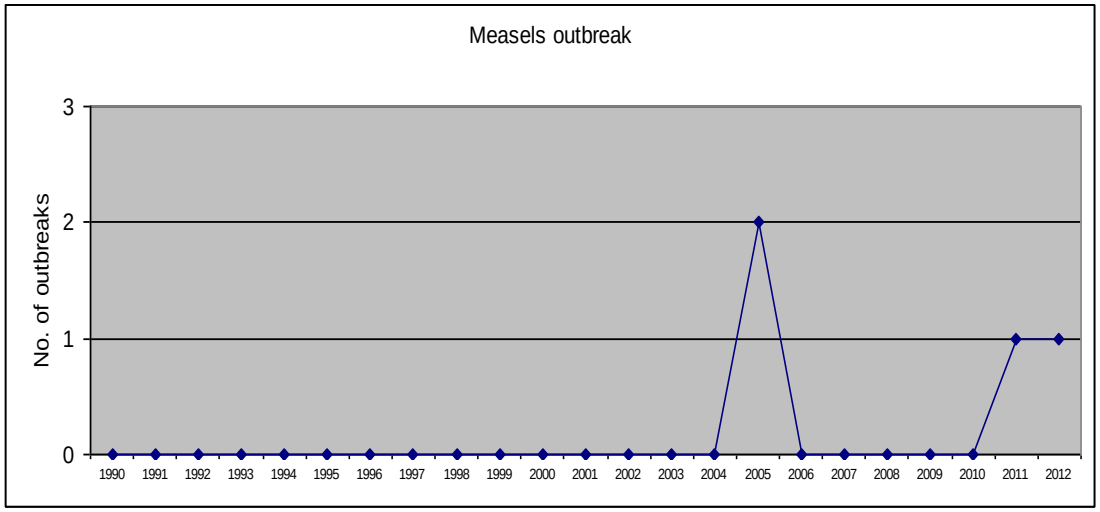


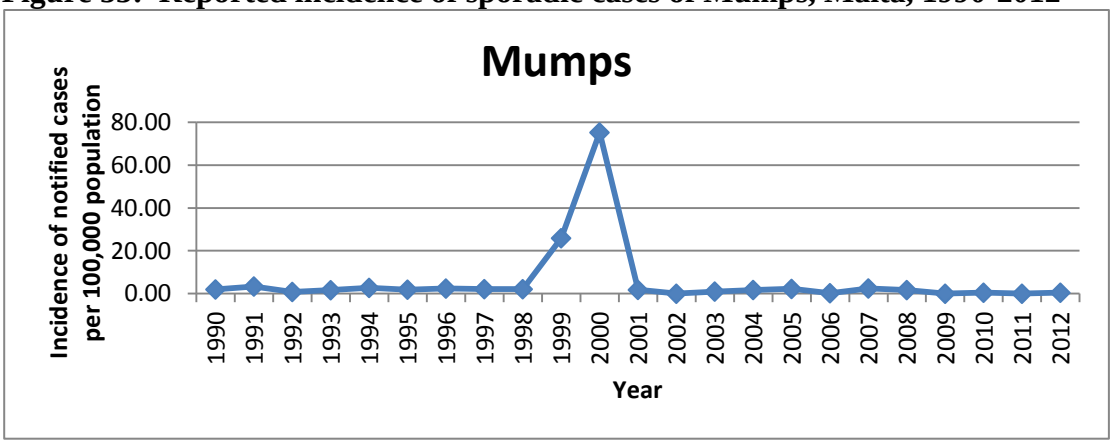
Figure 52: Number of reported outbreaks of measles, Malta, 1990-2012



Mumps

The reported incidence of mumps in Malta is on the decline. During 2002, there were eleven cases of mumps which is the highest reported number since 2001. This is a marked reduction from the unusually high number of reported cases (n=286) in the year 2000. No cases were notified between 2009 and 2012 (Figure 53).

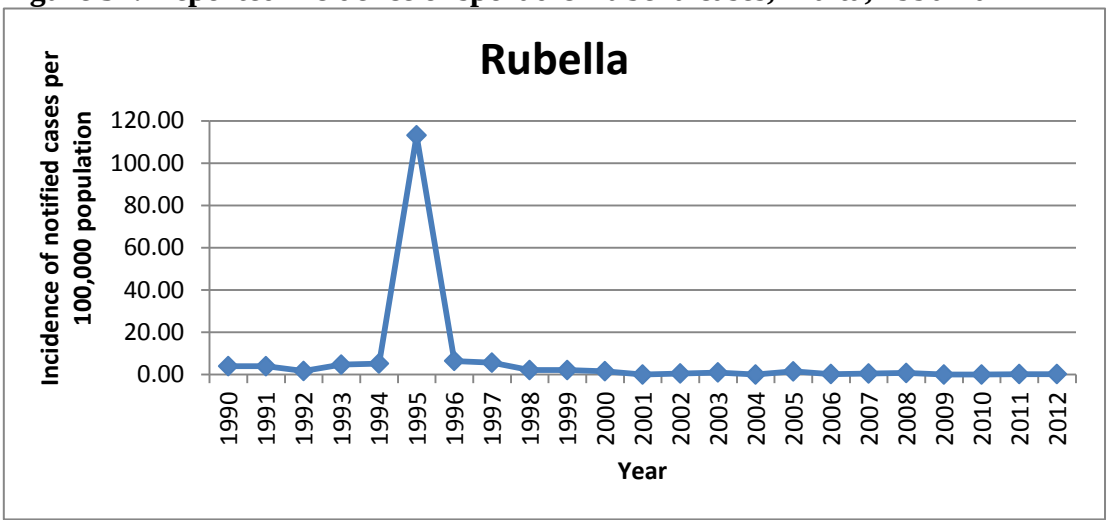
Figure 53: Reported incidence of sporadic cases of Mumps, Malta, 1990-2012



Rubella

Rubella notification has also declined in Malta with the introduction of vaccination. No cases were reported during 2001, 2004, 2009 and 2010. In 1995, there was a twenty-fold increase (n=418) over the previous year (Figure 54). Although the episode was not laboratory-confirmed, it led to concerns about the integrity of local herd immunity to rubella.

Figure 54: Reported incidence of sporadic Rubella cases, Malta, 1990-2012



In 1996, a cross-sectional study was performed in youths aged 14-15 years to determine the seroprevalence of rubella IgG antibodies. The study showed a high prevalence of humoral immunity against rubella amongst Maltese females in the pre-childbearing age group. However the study could not differentiate between vaccine induced immunity or that imparted by disease (Falzon D et al. 1998).

The coverage rate of Measles, Mumps and Rubella (MMR) vaccine reached 85% in 1999. This is still below what is required to ensure herd immunity. The reason behind this low coverage rate may be due to the scares linking of the measles vaccine with

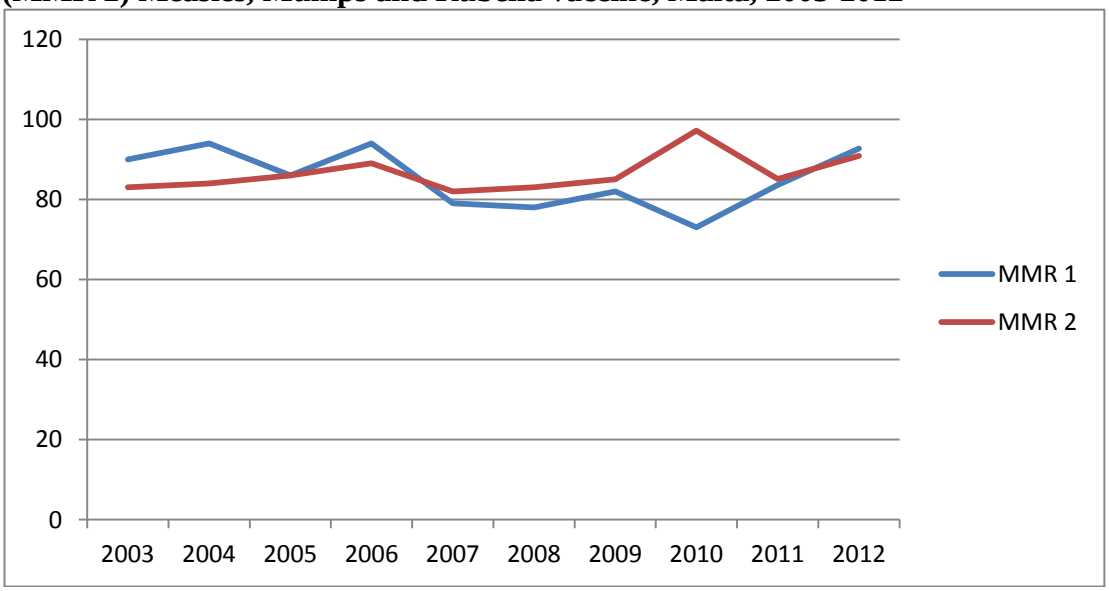
- Crohn's disease after in utero measles virus exposure (Ekbom A et al 1996);
- Inflammatory bowel disease (Thompson NP et al. 1998) and
- Infantile autism (Wakefield AJ et al. 1998) or

However this may well be due to under-reporting (Vassallo Aguis P et al. 1998) as many vaccines are given privately and reporting is not as good as with state vaccination.

Rubella was also one of the priority diseases selected by the European Network for European Surveillance. The Unit collaborates with the World Health Organisation in its efforts to implement strategies for measles and rubella elimination in the European Region by 2015 (following extension of the elimination target from 2010 to 2015).

Although the number of cases of mumps and rubella are not very high there have been clusters of these diseases in recent years and cases will continue to occur until community immunisation rates are high enough to provide effective herd immunity (Figure 55).

Figure 55: Percentage vaccination coverage for 1st dose (MMR 1) and 2nd dose (MMR 2) Measles, Mumps and Rubella vaccine, Malta, 2003-2012



Chickenpox (Varicella)

Although the incidence of chickenpox cases in Malta is on the decline, it still causes a significant burden in loss of school days, loss of work for parents, possible hospital admissions and possible complications. In healthy children, chickenpox is usually a self resolving disease and rarely results in serious complications. Adults, immunosuppressed individuals and pregnant mothers are more likely to get severe chickenpox complicated by pneumonitis.

In addition, chickenpox during the first 20 weeks of pregnancy may result in congenital varicella syndrome in 2% of infants. Varicella in the newborn often disseminates to multiple organs and may be fatal. About 1/4000 children with varicella zoster virus infection will develop encephalitis. In Malta during 2003 there was 1 death in an adult directly related to chickenpox.

An effective and safe vaccine is available however it is not included in the national vaccination schedule and its use in the private sector is of low priority not least because of its considerable cost (Attard Montalto S. 2002). It is used to protect people who are most at risk of serious complications from chickenpox infection.

Herpes Zoster

Just like for chickenpox, there has been a decreasing incidence of herpes zoster over the last few years in Malta. The implications for this condition are that it causes severe pain and the treatment (acyclovir) costs are very high.

Invasive *Haemophilus influenza* Type B (HiB)

This is a systemic infection due the bacterium *Haemophilus influenza*, often presenting as meningitis. With widespread use of vaccine in early childhood, it has become an uncommon disease in the EU countries. All EU countries have the HiB vaccine included in the national immunisation schedule and routine vaccination continues to have a great impact on the reduction of the incidence of the disease due to serotype b. The incidence of invasive *Haemophilus influenza* remains stable in Europe, with a notification rate of 0.39/100,000 in 2009. Malta has a similar trend with an average reported incidence of 0.33/100,000 between 2007 and 2009.

Variant Creutzfeldt-Jakob disease (vCJD)

Variant Creutzfeldt-Jakob disease (vCJD) is a relatively new and rare neurological disease, classified as a Transmissible Spongiform Encephalopathy (TSE). It was first identified in March 1996 in the UK, when 10 cases of a new disease with neurological symptoms were reported and subsequently associated with the Bovine Spongiform Encephalopathy (BSE), or “mad cow”-disease.

vCJD is caused by prions, composed of misfolded prion proteins (PrPSc), aggregates of which form in neurological tissue leading to progressive brain damage with characteristic signs and symptoms of the disease. Prions are stable and relatively resistant to proteases, high temperatures, UV radiation, and commonly used disinfectants.

There are various forms of prion disease and surveillance is primarily concerned with the variant form that is food acquired. It has various characteristics that define the diagnosis of vCJD with a post-mortem examination of brain tissue being a requisite.

Patients with vCJD develop prominent psychiatric (mostly depression, anxiety and withdrawal) or sensory symptoms and delayed onset of neurologic abnormalities (and ataxia) within weeks or months, and dementia and myoclonus late in the illness. The

disease invariably leads to death. Disease duration is 14 months on average. vCJD tends to affect younger individuals, with an average age of onset of around 28 years, compared to sporadic CJD, which tends to affect middle-aged and elderly individuals.

The incubation period for vCJD after foodborne exposure is thought to be around 10 years. No vaccine or treatment is available.

Most reported vCJD cases appear to have been infected through the consumption of bovine meat products contaminated with the agent of BSE. Transmission through the receipt of blood from an asymptomatic, infected donor has been reported.

No vCJD cases have been reported in Malta (recent notified cases have all been identified as sporadic cases CJD) but surveillance must remain ongoing as the condition is one that has statutory notification to ECDC apart from its importance in identifying sources that may be locally or externally based. In addition blood transfusion services remain vigilant towards potential donors who might have had exposure in other countries were the affection was common.

RECOMMENDATIONS

1. The Infectious Disease Prevention and Control Unit, being the national surveillance centre, to maintain adequate infrastructure to carry out surveillance and to manage communicable diseases.

2. To foster and strengthen collaborative links between microbiologists, clinical physicians and general practitioners in order to optimise the use of laboratory data and clinical services.

3. To enhance the diagnostic facilities for communicable diseases available at the national laboratories and to improve liaisons with reference laboratories abroad.

4. To enhance intersectoral coolbaoration with other entities on issues relevant to infectious disease control

5. To Being much better prepared to recognise and take action to control new infectious disease threats: previously unrecognised infection and re-emergent problems

6. To develop training programmes for epidemiologists, clinical physicians,environmental health offficers and microbiologists to enhance their expertise in dealing with communicable disease management and control.

7. To develop specific strategies for the control of priority communicable diseases.

8. Organising effective programmes to prevent the transmission of infectious diseases

PART TWO
PRIORITISATON OF COMMUNICABLE DISEASES

The effective control of infectious disease through Public health measures is very challenging owing to the presence of a wide range of pathogens requiring different interventions for their prevention and control. Moreover, resources for disease surveillance and implementation of public health measures are often limited. In view of this, it is essential that the available resources are efficiently and effectively allocated to prevent and control primarily those infectious diseases of major public health importance.

However, the vast number of infectious diseases, each with different prevalence, morbidity, mortality and treatability amongst other factors, makes it difficult to compare such diseases based on their overall public health importance.

Prioritisation exercise

Aim

The aim of the exercise was to systematically prioritise communicable diseases/pathogens by public health importance in order to guide surveillance activities and effectively allocate resources for the prevention and control of key pathogens in Malta.

Methods

We compiled a list of 77 infectious diseases/pathogens (Annex 1, table 7) based on the:

- List of infectious diseases notifiable by Law in Malta (Government Gazette 24th January 2004)
- Infectious diseases reported to IDCU in the previous 5 years that generated considerable public and media attention

We utilised a predetermined weighting and scoring system (Krause, 2008) to rank the pathogens based on the following set of 13 public health criteria (Annex 2, Table 8):

- Burden of disease (incidence, severity and mortality)
- Epidemiological dynamic (outbreak potential, trend and emerging potential)
- Information need (evidence of risk factors/groups, international duties and public attention)
- Health gain opportunity (preventability and treatability)

On June 2012, we held a consultation meeting with key experts and stakeholders in infectious diseases, mainly, infectious disease physicians, microbiologists and pathologists, infection control experts, clinical consultants and public health specialists. A total of 78 experts were invited to the meeting during which they participated in the exercise by completing the following paper based forms:

- General ranking of public health criteria (weighting)
- Pathogen-by-pathogen scoring according to the public health criteria.

For each pathogen, we prepared a fact sheet with all the necessary information covering the selected public health criteria to assist participants in completing this part of the prioritisation exercise

Separate face to face meetings were held with those experts who could not attend the consultation meeting in order to facilitate the completion and collection of the scoring sheets.

Study design

Pathogen scoring: We utilised a 3 tiered scoring system. Each public health criterion was allocated either of 3 scores -1 (low importance), 0 (average importance or insufficient knowledge available), +1 (high importance). For each criterion, the scores were defined to allow a common understanding of the scoring criteria (Annex 2, Table 8).

Each pathogen was then scored according to each of the 13 public health criteria. The scores given by the participating experts were collated and the mode of the scores for each of the criteria by pathogen was calculated to obtain a final score.

Weighting of the public health criteria: Each of the criteria was assigned a weight in order to enhance the efficiency of the exercise. This was done independently and before the pathogen by pathogen scoring in order to minimise bias. The participating experts were asked to rank the public health criteria (from 0-12) by order of perceived importance, with 12 being the most important and 0 being the least important. The same rank could be given to more than one criterion. The weight was then calculated as the average rank for each criterion.

We obtained the weighted pathogen scores by multiplying the weight of the criteria by the corresponding pathogen score. For example if the average weight for the international incidence was 7.76 and the pathogen score for the international incidence of AIDS was 0 then the weighted score for the international incidence of AIDS will be 0 (7.76 x 0).

A total weighted score was finally generated by adding the weighted scores of all 12 categories per pathogen. The total weighted score was then used to rank the 76 pathogens (Table 9).

Results

A total of 60 people (76.9% response rate) gave weighting scores for the public health criteria and 57 people (73% response rate) submitted the pathogen by pathogen scores.

Table 9 overleaf presents the ranking of the 77 selected diseases/pathogens by order of decreased ranking. Severe acute respiratory infections (SARIs) and severe acute respiratory syndrome (SARS) were the diseases with the highest weighted scores

followed by AIDS, HIV, Influenza, campylobacter, nosocomial infections and MRSA.

The total weighted scores ranged from +56.10 (SARIs) to – 96.58 (Erysipelas) with the median being -35.67 (Hepatitis C).

Next steps

In order to concentrate Public Health effort on the infectious diseases of main concern, the Health Promotion and Disease Prevention Directorate will be liaising and consulting with the relevant stakeholders in order to develop strategies for the prevention and control of the following priority diseases namely:

- SARIs including influenza
- AIDS and HIV
- Campylobacter
- MRSA (with a focus on MRSA in the community)

No strategy will be developed by the HPDP directorate for nosocomial infection prevention and control falls as this area falls under the remit of the Infectious Disease Unit (IDU) within the Mater Dei Hospital.

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Annex 1

Table 7 : Diseases/Pathogens selected for prioritisation, listed in alphabetical order			
• AIDS • Acute viral encephalitis • Acute flaccid paralysis • Anthrax • Avian influenza A (H5N1) • Bacterial meningitis, other then meningococcal • Botulism • Brucellosis • Campylobacter • Chickenpox/shingles • Chickungunya • Chlamydia • Congenital rubella syndrome • Cryptosporidiosis • Cytomegalovirus • Dengue fever • Diphtheria • Echinococcosis • E.coli 0157 • E.coli other than 0157 • Erysipelas	• Giardiasis • Gonococcal infection • Granular conjunctivitis/ trachoma • *Haemophilus influenza* group B (meningitis) • Hand, foot and mouth disease • Hepatitis A • Hepatitis B • Hepatitis C • HIV infection • Influenza • Legionellosis • Leishmaniasis • Leprosy • Leptospirosis • Listerosis • Malaria • Measles • Meningococcal disease • MRSA	• Mumps • Norovirus • Nosocomial Infection • Pertussis • Puerperal fever • Plague • Pneumococcal infection • Pneumonia • Poliomyelitis • Q-fever • Rabies • Relapsing fever • Rotavirus • Rubella • Salmonella • Severe acute respiratory infection • Severe acute respiratory syndrome (SARS) Scabies Slapped cheek syndrome	• Scarlet fever • Shigella Streptococci group B • Streptococci group A invasive disease • Syphilis • Tetanus • Toxoplasmosis • Trichinosis • Tularaemia • Typhoid fever • Typhus • Tuberculosis • Unspecified food borne illness • Variant Creutzfeldt-Jakob disease • Viral haemorrhagic fevers • West nile fever • Yellow fever • Yersinosis

Annex 2

Table 8: Scoring criteria for prioritisation of communicable diseases

Criteria	Values		
	-1	**0**	**1**
Burden of disease			
Incidence	‹1/100,000	1-20/100,000	›20/100,000
Severity	Hospitalization is rare, work loss is less than 2 days, no persisting complications	Hospitalization is uncommon, work loss of 2-5 days, may have some persisting complications	Hospitalization is frequent, work loss is greater than 5 days , persisting complications occur
Mortality	<1per 100,000 / <0.01%	1-9 per 100,000 / 0.01-1%	›10 per 100,000 / >1 %
Case-fatality rate	‹0.01%	0.01-1%	›1%
Epidemiological dynamic			
Outbreak potential	No Outbreaks	Outbreaks Possible	Outbreaks Occur
Trend	Diminishing incidence rates	Stable incidence rates	Increasing incidence rates
Emerging potential	Disease already endemic or unlikely to be introduced in Malta	Disease has the potential to be introduced to Malta sporadically	Disease is likely to emerge and may become established locally
Information need			
Evidence for risk factors/groups	Risk factors and risk groups are identified based on scientific evidence	Risk factors and risk groups are known but scientific evidence is not known	Risk factors and risk groups are not known
International duties	No international duties or political agenda	No international duties but informal political expectations	International duties or explicit political agendas
Public Attention	Minor public attention	Moderate public attention	High public attention
Health-gain opportunity			
Preventability	There is no need for preventive measures or there are few possibilities.	Concepts for prevention are established but there is a need for further research to improve effectiveness	Strong need for further research on preventive measures because they are required but concepts for prevention are missing
Treatability	Medical treatment is rarely necessary, or effective treatments are available	Medical treatments are frequently indicated but have a limited influence on the prognosis	Medical treatment is desirable but currently there is no treatment available

Annex 3

Table 9: Prioritisation Scores for selected diseases/pathogens by order of decreased ranking

		Burden of disease					Epidemiological dynamic			Information need			Health opport
		Incidence /100,000		Severity	Mortality rate/CFR		Outbreak potential	Trend	Emerging potential	Evidence for risk factors	Inter national duties	Public attention	Prevent ability
		Malta	Inter national		Malta	Inter national	Malta	Malta					
Weight of criterium		9.07	7.76	10.47	10.57	9.47	9.58	7.95	8.03	8.05	7.12	6.85	10.03
Rank	Pathogen	*Crude weighted scores*											
1	Severe Acute Respiratory tract Infections (SARI)	9.07	9.07	10.47	10.57	9.47	9.58	0	-8.03	-8.05	7.12	6.85	0
2	Severe acute respiratory syndrome (SARS)	-9.07	-7.76	10.47	-10.57	-9.47	9.58	0	0	8.05	7.12	0	10.03
3	AIDS	0	0	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	6.85	0
4	HIV Infection	0	0	10.47	-10.57	0	0	7.95	-8.03	-8.05	7.12	6.85	0
5	Influenza	9.07	7.76	0	0	-9.47	9.58	0	-8.03	-8.05	7.12	6.85	0
6	Campylobacter	9.07	7.76	0	-10.57	9.47	0	7.95	-8.03	-8.05	7.12	0	0
7	Nosocomial Infection	-9.07	7.76	10.47	10.57	9.47	0	0	-8.03	-8.05	7.12	-6.85	0
8	MRSA	9.07	7.76	10.47	0	0	-9.58	-7.95	-8.03	-8.05	7.12	0	0
9	Pertussis	-9.07	0	10.47	-10.57	-9.47	9.58	7.95	0	-8.05	7.12	-6.85	0
10	Legionellosis	0	0	10.47	-10.57	9.47	9.58	0	-8.03	-8.05	7.12	0	0
11	Chikungunya	-9.07	-7.76	10.47	-10.57	-9.47	0	0	0	8.05	7.12	0	0
12	Tuberculosis	0	0	10.47	-10.57	0	0	7.95	-8.03	-8.05	7.12	6.85	0
13	Viral Haemorrhagic Fevers	-9.07	0	10.47	-10.57	9.47	-9.58	0	0	-8.05	7.12	-6.85	0
14	Pneumococcal infection	9.07	7.76	0	-10.57	9.47	0	0	-8.03	-8.05	7.12	-6.85	0
15	Bacterial meningitis (other than meningococcal)	0	-7.76	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	6.85	0
16	E. Coli 0157	0.00	-7.76	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	6.85	0
17	Meningococcal disease	0	-7.76	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	6.85	0
18	Pneumonia	-9.07	7.76	10.47	10.57	9.47	0	0	-8.03	-8.05	-7.12	-6.85	0
19	Anthrax	-9.07	-7.76	10.47	-10.57	9.47	0	0	0	-8.05	7.12	0	0
20	Acute flaccid paralysis	-9.07	-7.76	10.47	-10.57	-9.47	-9.58	0	0	8.05	7.12	-6.85	0
21	Dengue Fever	-9.07	-7.76	10.47	-10.57	-9.47	0	0	0	8.05	7.12	0	0
22	Salmonella	9.07	7.76	0	-10.57	-9.47	0	0	-8.03	-8.05	7.12	0	0
23	Unspecified food-borne illness	9.07	7.76	-10.47	-10.57	-9.47	9.58	0	-8.03	-8.05	7.12	0	0
24	Q-fever	-9.07	-7.76	0	-10.57	-9.47	9.58	7.95	0	-8.05	7.12	6.85	0
25	Hepatitis B	0	0	10.47	-10.57	0	-9.58	-7.95	-8.03	-8.05	7.12	0	0

		Burden of disease					Epidemiological dynamic			Information need			Health opport
		Incidence /100,000		Severity	Mortality rate/CFR		Outbreak potential	Trend	Emerging potential	Evidence for risk factors	Inter national duties	Public attention	Prevent ability
		Malta	Inter national		Malta	Inter national	Malta	Malta					
Weight of criterium		9.07	7.76	10.47	10.57	9.47	9.58	7.95	8.03	8.05	7.12	6.85	10.03
Rank	Pathogen	*Crude weighted scores*											
26	Syphilis	0	0	10.47	-10.57	-9.47	0	7.95	-8.03	-8.05	7.12	-6.85	0
27	Chickenpox/ Shingles	9.07	7.76	-10.47	-10.57	0	9.58	0	-8.03	-8.05	-7.12	0	0
28	Streptococci Group A Invasive disease	-9.07	0	10.47	-10.57	9.47	-9.58	0	0	8.05	-7.12	0	-10.03
29	Scarlet Fever	0	0	0	-10.57	-9.47	9.58	7.95	-8.03	-8.05	-7.12	6.85	0
30	Relapsing fever (Tick/Louse-borne)	-9.07	0	0	-10.57	9.47	-9.58	0	8.03	-8.05	-7.12	6.85	0
31	Avian Influenza A (H5N1)	-9.07	-7.76	10.47	-10.57	-9.47	0	0	0	-8.05	7.12	6.85	0
32	Acute viral encephalitis	-9.07	-7.76	10.47	-10.57	9.47	-9.58	0	-8.03	8.05	-7.12	-6.85	-10.03
33	Botulism	-9.07	-7.76	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	-6.85	0
34	Brucellosis	-9.07	-7.76	10.47	-10.57	9.47	0	0	-8.03	-8.05	7.12	-6.85	0
35	Tetanus	-9.07	-7.76	10.47	-10.57	9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
36	Yellow Fever	-9.07	-7.76	0	-10.57	9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
37	Diphteria	-9.07	-7.76	10.47	-10.57	9.47	-9.58	0	0	-8.05	7.12	-6.85	0
38	West Nile Fever	-9.07	-7.76	10.47	-10.57	0	-9.58	0	0	-8.05	7.12	-6.85	0
39	Hepatitis C	-9.07	0	10.47	-10.57	0	-9.58	-7.95	-8.03	-8.05	7.12	0	0
40	*Haemophilus influenza* group B meningitis	-9.07	-7.76	10.47	-10.57	9.47	-9.58	-7.95	-8.03	-8.05	7.12	6.85	0
41	Gonococcal infection	0	0	0	-10.57	-9.47	0	7.95	-8.03	-8.05	7.12	-6.85	0
42	Streptococci Group B	-9.07	-7.76	10.47	-10.57	9.47	9.58	0	-8.03	-8.05	-7.12	-6.85	0
43	Hand Foot & Mouth Disease	0	0	-10.47	-10.57	-9.47	9.58	7.95	-8.03	-8.05	-7.12	6.85	0
44	Leishmaniasis	0	0	10.47	-10.57	9.47	-9.58	0	-8.03	-8.05	-7.12	-6.85	0
45	Chlamydia	0	7.76	-10.47	-10.57	-9.47	0	7.95	-8.03	-8.05	7.12	-6.85	0
46	Plague	-9.07	-7.76	10.47	-10.57	9.47	0	-7.95	-8.03	-8.05	7.12	-6.85	0
47	Rabies	-9.07	-7.76	10.47	-10.57	9.47	-9.58	-7.95	0	-8.05	7.12	-6.85	0
48	Poliomyelitis	-9.07	-7.76	10.47	-10.57	-9.47	-9.58	-7.95	0	-8.05	7.12	-6.85	0
49	vCreutzfeldt-Jakob Disease	-9.07	-7.76	10.47	-10.57	-9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
50	Cryptosporidiosis	-9.07	0	0	-10.57	0	0	0	-8.03	-8.05	7.12	-6.85	0

		Burden of disease					Epidemiological dynamic			Information need			Health opport
		Incidence /100,000		Severity	Mortality rate/CFR		Outbreak potential	Trend	Emerging potential	Evidence for risk factors	Inter national duties	Public attention	Prevent ability
		Malta	Inter national		Malta	Inter national	Malta	Malta					
Weight of criterium		9.07	7.76	10.47	10.57	9.47	9.58	7.95	8.03	8.05	7.12	6.85	10.03
Rank	Pathogen	*Crude weighted scores*											
51	Malaria	-9.07	0	0	-10.57	9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
52	Hepatitis B	0	0	10.47	-10.57	0	-9.58	-7.95	-8.03	-8.05	7.12	0	0
53	Norovirus	0	7.76	-10.47	-10.57	-9.47	9.58	0	-8.03	-8.05	-7.12	0	0
54	Giardiasis	0	7.76	-10.47	-10.57	-9.47	0	0	-8.03	-8.05	7.12	-6.85	0
55	Rotavirus	-9.07	0	0	-10.57	-9.47	9.58	0	-8.03	-8.05	-7.12	-6.85	0
56	Peurperal Fever	-9.07	7.76	10.47	-10.57	-9.47	-9.58	0	-8.03	-8.05	-7.12	-6.85	10.03
57	Granular conjunctivitis/ trachoma	-9.07	7.76	10.47	-10.57	-9.47	-9.58	0	0	-8.05	-7.12	-6.85	0
58	Leptospirosis	-9.07	-7.76	0	-10.57	9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
59	Congenital Rubella Syndrome	-9.07	-7.76	0	-10.57	-9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
60	Echinococcosis	-9.07	-7.76	10.47	-10.57	-10.57	-9.58	0	0	-8.05	7.12	-6.85	0
61	Shigella	-9.07	0	0	-10.57	-9.47	0	0	-8.03	-8.05	7.12	-6.85	0
62	Scabies	0	-7.76	-10.47	-10.57	-9.47	9.58	0	-8.03	-8.05	-7.12	6.85	0
63	Listeriosis	-9.07	-7.76	-10.47	-10.57	9.47	-9.58	0.00	0	-8.05	7.12	-6.85	0
64	Mumps	0	0	-10.47	-10.57	-9.47	0	0	-8.03	-8.05	7.12	-6.85	0
65	Leprosy	-9.07	-7.76	-10.47	-10.57	-9.47	-9.58	-7.95	0	8.05	7.12	-6.85	10.03
66	Typhus	0	0	0	-10.57	0	0	-7.95	-8.03	-8.05	-7.12	-6.85	0
67	E. Coli other then O157	0	0	0	-10.57	-9.47	0	0	-8.03	-8.05	-7.12	-6.85	0
68	Typhoid Fever	-9.07	-7.76	10.47	-10.57	0	-9.58	-7.95	-8.03	-8.05	7.12	-6.85	0
69	Slapped cheek syndrome	0	-7.76	-10.47	-10.57	-9.47	9.58	7.95	-8.03	-8.05	-7.12	-6.85	0
70	Measles	-9.07	-7.76	0	-10.57	-9.47	0	0	-8.03	-8.05	7.12	-6.85	0
71	Yersiniosis	-9.07	0	0	-10.57	0	-9.58	-7.95	-8.03	-8.05	7.12	-6.85	0
72	Rubella	-9.07	-7.76	-10.47	-10.57	-9.47	9.58	0	-8.03	-8.05	7.12	-6.85	0
73	Trichinosis	-9.07	-7.76	0	-10.57	-9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
74	Tularaemia	-9.07	-7.76	0	-10.57	-9.47	-9.58	0	-8.03	-8.05	7.12	-6.85	0
75	Cytomegalovirus	-9.07	0	0	-10.57	-9.47	-9.58	0	-8.03	-8.05	-7.12	-6.85	0
76	Toxoplasmosis	-9.07	-7.76	0	-10.57	-9.47	-9.58	0	-8.03	-8.05	0.00	-6.85	0
77	Erysipelas	-9.07	0	-10.47	-10.57	-9.47	-9.58	-7.95	-8.03	-8.05	-7.12	-6.85	0