

Male Infant Circumcision as a ‘HIV Vaccine’

Barry Lyons, Trinity College Dublin

Corresponding author: Barry Lyons, Division of Ethics, School of Medicine, Trinity College Dublin, Ireland. Tel: (00353) 1 4096482; Email: barry.lyons0@gmail.com

This article deals with the specific claim that prophylactic male infant circumcision should be employed to prevent HIV transmission in countries in which the prevalence of HIV is relatively low. In a recent editorial, Australian researchers sought to promote the procedure as a ‘surgical vaccine’ against HIV in their country. This raises the question whether it would be reasonable for the UK to adopt a policy of mass infant male circumcision in order to protect individuals from heterosexually acquired infection with HIV. A review of the relevant data and associated commentary indicates that the actual benefits of real-world circumcision policies to prevent HIV transmission are disputed and that circumcision, at best, provides partial protection. In addition, it is uncertain whether infant circumcision confers the same benefits that the adult procedure is proposed to provide. Reasons for performing circumcisions on infants include that the procedure is easier, less complicated and cheaper. However, it is not risk free. Despite arguments to the contrary, this article contends that it is morally problematic to operate on thousands of male infants each year for little benefit to children *qua* children. It is also argued that the use of the term ‘surgical vaccine’ to describe the procedure is both inaccurate and misleading.

Introduction

Male infant circumcision (MIC) is possibly the most widely performed surgical intervention on children. It has been calculated that 30 per cent of the global male population is circumcised (WHO/UNAIDS, 2007a), but rates vary widely; from Angola, where it is estimated that 99 per cent of infant males undergo ritual circumcision (Arie, 2010) to Finland, where only around 200 boys are circumcised for non-medical reasons per year (Askola, 2011). MIC is also one of the most controversial procedures, with widespread expression of divergent and conflicting opinions regarding its lawfulness and moral status.¹ The motives for performing the procedure might roughly be divided into (i) therapeutic, (ii) religious or cultural and (iii) putative disease prevention. Those performed for therapeutic reasons would seem to be uncontroversial, when the intervention is to treat a disease process and is to the clear health benefit of the child. Other motivations are more contentious. Much has been written about the ethics of performing intrusive non-therapeutic surgery on unconsenting children, and it seems that there is an unbridgeable gap between those that hold that it is a parental prerogative to authorize this procedure for cultural or religious reasons and those who regard it as unjustifiable mutilation (Benatar and Benatar, 2003). The aim of this article is not to add to this body of

literature, but rather to examine one aspect of the third group, that of the use of infant circumcision to prevent disease.

In common with other commentators, such as the Tasmanian Law Reform Institute (2009), this article takes the position that circumcision is non-therapeutic if performed for reasons other than the treatment of an ‘existing disease, illness or deformity of the body’. A ‘prophylactic’ circumcision performed with the intention of preventing or diminishing the possibility of a future disease is a non-therapeutic procedure, although this does not make it an illegitimate one. My interest in this article lies with the specific claim that prophylactic MIC should be employed to prevent HIV transmission through heterosexual contact in a low prevalence environment. In an editorial in the *Medical Journal of Australia*, three researchers called on their nation to embrace infant ‘circumcision now to prevent heterosexual HIV transmission in 2030’ because it ‘makes sense’ (Cooper *et al.*, 2010), an appeal that has been forcibly reiterated more recently (Morris *et al.*, 2012a). The prevalence of HIV is probably slightly higher in the UK (0.14–0.16 per cent) (Health Protection Agency, 2011) than Australia (approximately 0.1 per cent) (UNAIDS, 2012), and so what is proposed for the latter might also have implications for the prevention of HIV in the former. As part of the movement to encourage governments to promote circumcision for

this reason, some proponents of this activity have termed the procedure a 'surgical vaccine' (Ben *et al.*, 2009), a description that has been repeated elsewhere (Klausner, 2008; Cooper *et al.*, 2010, 2011; Belluck, 2011). According to Fox and Thomson (2012), citing a report from Swaziland, the idea that 'circumcision is like an AIDS vaccine' is prevalent among some populations.

Thus, the aim of this article is 3-fold; first, to evaluate the empirical evidence that has led to the evolution of proposals to develop mass circumcision programmes in order to reduce the incidence of HIV; second, to assess whether it would be reasonable for the UK to adopt a policy of mass infant male circumcision in order to effectively protect individuals from infection with HIV and third, to discuss whether circumcision meaningfully can be termed a vaccine.

Circumcision as Prophylaxis against Disease

The idea that circumcision reduces the rate of HIV transmission is founded on the claim that the virus accesses the bloodstream during vaginal coitus through the foreskin. It is proposed that the scarring resulting from circumcision provides greater resistance to female-to-male viral transmission. The World Health Organization (WHO) has previously endorsed male circumcision as a means to reduce HIV transmission from heterosexual contact in hyperendemic countries (WHO/UNAIDS, 2007b). What Cooper *et al.* (2010) proposed was that a country with a low HIV prevalence should take the opportunity to similarly promote circumcision in an effort at a 'population-wide approach to HIV prevention'. In a previous article by one of the authors (Morris, 2007), neonatal circumcision is advocated as prophylaxis against a range of genito-urinary diseases (and as a socio-sexual benefit):

Circumcision of males represents a surgical "vaccine" against a wide variety of infections, adverse medical conditions and potentially fatal diseases over their life-time, and also protects their sexual partners. In experienced hands, this common, inexpensive procedure is very safe, can be pain-free and can be performed at any age. The benefits vastly outweigh risks... Circumcision has socio-sexual benefits and reduces sexual problems with age. It has no adverse effect on penile sensitivity, function, or sensation during sexual arousal. Most women prefer

the circumcised penis for appearance, hygiene and sex. Given the convincing epidemiological evidence and biological support, routine circumcision should be highly recommended by all health professionals.

However, thus far no western medical representative organization has viewed the health or social benefits as sufficient to justify a recommendation in favour of routine neonatal circumcision. Guidance from the British Medical Association (BMA, 2003) viewed the possible health benefits accruing to a circumcised boy as being 'insufficient for this alone to be a justification', while a policy statement on circumcision issued by the Royal Australasian College of Physicians (RACP, 2010) states that

After reviewing the currently available evidence, the RACP believes that the frequency of diseases modifiable by circumcision, the level of protection offered by circumcision and the complication rates of circumcision do not warrant routine infant circumcision in Australia and New Zealand.

Both the BMA and the RACP allow for the circumcision of male children when requested by parents, although the legal status of the procedure is not absolutely certain in either jurisdiction (Queensland Law Reform Commission, 1993; Fox and Thomson, 2005). The matter has been considered in a number of other states. Sweden is one of the few countries to have specific legislation restricting the practice of circumcision (introduced in 2001 after an infant fatality), allowing only registered physicians (or in the first 2 months of life a competent religious practitioner who has obtained special authorization from the National Board of Health and Welfare) to perform the procedure, and always under anaesthesia (BBC News, 2001). However, the law reportedly has produced some difficulties as a survey of members of the Swedish Pediatric Surgeons Association identified that two out of every three pediatric surgeons did not want to perform non-therapeutic circumcisions, perceiving it to be an infringement of the child's human rights, and 12 of 21 local municipalities also refused to perform the procedure for similar reasons (The Local, 2009). Despite this reluctance, it appears that the rate of circumcisions continued unabated, generally carried out by uncertified individuals. In December 2010, Södertörn District Court handed down the first Swedish conviction to an unlicensed individual 'for illegally removing the foreskin from small boys' (The Local, 2010). More recently, a court in Germany found non-therapeutic circumcision to be

contrary to the best interests of the child, although the legal significance of this case remains uncertain (BBC News, 2012). The Tasmania Law Reform Institute (2012) has also called for the criminalization of some forms of non-therapeutic, non-religious/cultural circumcision. On the other hand, the American Academy of Pediatrics (2012) has updated its policy statement on MIC, stating that the benefits outweigh the risks, but stopping short of recommending routine circumcision for all male newborns. Considering the same evidence, the Royal Dutch Medical Association (KNMG, 2010) was unconvinced, and they recently stated that not only was the procedure medically unnecessary but it was also a human rights abuse.

Arguments founded on rights, however, are not a form of discourse that necessarily appeals to some proponents of prophylactic circumcision. In his article (under the subtitle of ‘fictions’), Morris argued that

Various myths abound concerning circumcision. Emotive arguments, such as ones prevalent on anti-circumcision internet sites, are not supported by current scientific evidence. What remains is nebulous, convoluted legalistic discourses such as consent or “human rights” issues (Morris, 2007: 1155).

However, in the context of mass circumcision as a public health issue, Fox and Thomson (2012) argue that male circumcision should be considered a matter of social justice, a paradigm which demands that such initiatives must comply with international ethico-legal and human rights standards. This appears correct. Non-therapeutic surgery clearly engages the right to bodily integrity, at the very least. However, engagement does not straightforwardly imply a breach. In practice, a human right may be qualified not only by limitations attached to it as an individual right (for example in a derogation clause); rights also qualify each other, and public health issues often engage competing rights (Coggon, 2012). It would be reasonable for Morris to contend that individual human rights arguments could serve to obstruct the state from achieving its population health-related obligations, but not to maintain that human rights are irrelevant to the debate. As discussed below, in any specific case, the relationship between a state’s duties to protect individual bodily integrity on the one hand, and the imperative to advance the health of the population on the other, cannot meaningfully be articulated without recourse to analysis of the relevant benefits and burdens.

Circumcision and HIV Prevention—The Empirical Evidence

Kass (2001) sets out a code of ethics for governing public health interventions in a pluralistic, politically liberal environment; rules for determining the balance between the rights of citizens to non-interference and the political obligation to address public health issues. According to this code, the power invested in public health enterprises should not go unchecked, and any encroachment on negative individual rights must be subject to scrutiny. This could be done through the application of a framework of ethics designed specifically for public health, one which assesses the equilibrium between the political duties to protect and enhance the public’s health and the responsibility to avoid unwarranted infringements of individual liberty and bodily integrity. Kass’ code of ethics proposes a six-step framework ‘designed to help public health professionals consider the ethics implications of proposed interventions, policy proposals, research initiatives and programs’. The first of these six steps pertains to the goals of the proposed public health measure and is usually assessed in terms of an aim to reduce morbidity and/or mortality. In this instance, the aim of a mass circumcision programme is to reduce the incidence of HIV transmission and consequent ill-health and premature death. The second refers to the likely effectiveness of the planned intervention in achieving the stated goals, while the third relates to the known or potential burdens of the programme. These essentially are empirical questions and thus, in order to assess whether it is reasonable to introduce routine circumcision for HIV prophylaxis, it would seem apposite to first evaluate the relevant evidence.

Three randomized trials conducted in South Africa (Auvert *et al.*, 2009), Uganda (Bailey *et al.*, 2007) and Kenya (Gray *et al.*, 2007) reported that adult male circumcision was effective in reducing the risk of adult males contracting HIV through heterosexual vaginal intercourse. The possibility of there being a similar benefit accruing to men who have sex with men (MSM) remains uncertain (Wiysonge *et al.*, 2011), and so is not considered further here. The findings relating to heterosexual transmission appear to have been supported by preceding (Siegfried *et al.*, 2005) and subsequent (Siegfried *et al.*, 2009) systematic analyses of relevant studies. The three countries where the randomized trials were conducted have a high prevalence rate of HIV. This led the UN and the WHO (2007b) to

endorse male circumcision as one arm of a strategy to reduce the prevalence of HIV:

At the end of 2006, an estimated 39.5 million people were living with HIV and 4.3 million became newly infected with the virus that year. Prevention must be greatly prioritized in the response to AIDS and efforts are being made to find new prevention technologies to bolster the package of already known effective prevention methods. Male circumcision is one of these new potential methods.

The National Institute of Health sponsored trials from Kisumu, Kenya and Rakai District, Uganda indicated that adult male circumcision provided at least a 53 and 51 per cent reduction in risk of acquiring HIV infection, respectively. These trials were terminated early because of the perception that circumcision provided substantial benefit. The results from the South Africa Orange Farm Intervention Trial, sponsored by the French National Agency for Research on AIDS, demonstrated at least a 60 per cent reduction in HIV infection among men who were circumcised. The WHO/UNAIDS (2007b) recommendations thus included the following:

- (1) Countries with hyperendemic and generalized HIV epidemics and low prevalence of male circumcision should . . . progressively expand access to safe male circumcision services within the context of ensuring universal access to comprehensive HIV prevention, treatment, care and support.
- (2) Such countries should consider scaling up access to male circumcision services as a priority for adolescents, young men and as indicated by the local epidemiology and other considerations, older men at particularly high risk of HIV.
- (3) Since neonatal circumcision is a less complicated and risky procedure than circumcision performed in young boys, adolescents or adults, such countries should consider how to promote neonatal circumcision in a safe, culturally acceptable and sustainable manner.

However, the results of these studies and their interpretation, and the recommendations issued by WHO/UNAIDS have proven to be controversial. In summarizing the concerns raised by analysis of the three pivotal studies, Green *et al.* (2008: 193) identified methodological issues 'that might have influenced and skewed the results'. These included: (i) that the three studies were terminated early, possibly exaggerating

the therapeutic effect; (ii) the experiments were of short duration; (iii) no long-term follow-up has been or can be done; (iv) a large number of participants were lost to follow-up and (v) some infections might have come from non-sexual sources. As a consequence the drive

to institute mass circumcision in Africa . . . is based on an incomplete evaluation of real-world preventive effects over the long-term—effects that may be quite different outside the research setting and circumstances, with their access to resources, sanitary standards and intensive counselling. Moreover, proposals for mass circumcision lack a thorough and objective consideration of costs in relation to hoped-for benefits. No field-test has been performed to evaluate the effectiveness, complications, personnel requirements, costs and practicality of proposed approaches in real-life conditions.

There are other concerns germane to this article, not listed above. First, the trials were conducted on adult volunteers. Even if the data were robustly valid, it does not indicate that performing the procedure on a neonate will provide the same degree of immunity to HIV (Sidler *et al.*, 2008). Second, although the risks attached to circumcision are less in infants than in adult males, this does not mean that they are negligible. In their report on circumcision, the British Association of Paediatric Surgeons cited the incidence of complications as being as high as 33 per cent (Godbole *et al.*, 2007), while one account of single practitioner religious circumcision in the UK identified a complication rate of 44.8 per cent (Paranthaman *et al.*, 2011). A relatively recent analysis of published data summarized the risk of an adverse event arising from the procedure as ranging from 0 to 16 per cent in infants, with the probability of suffering a severe adverse event being between 0 and 2 per cent. The median frequency of reported complications was 1.5 per cent (Weiss *et al.*, 2010). Occasional fatalities have occurred (Williams and Kapila, 1993), although these undoubtedly are rare when the procedure is performed in a healthcare facility by trained staff. However, it is also the case, despite the protestations of Morris, that infants who have been circumcised suffer pain and demonstrate exaggerated behavioural responses to later painful events when compared with uncircumcised infants. It has been suggested that they develop a 'pain memory' from the time of circumcision leading to a degree of hypersensitivity to unpleasant stimuli, although how long this persists is unknown (Taddio and Katz, 2005).

While appreciating the concerns raised by those who were sceptical of the results and implications of the

aforementioned trials, on reviewing the available evidence in 2007, the French National AIDS Council (Conseil National du Sida (CNS), 2007) stated that '(t)he reduction in the risk of transmission linked to male circumcision appears to be very real . . . male circumcision therefore appears to be a possible method of reducing risk in specific situations.' However, as the title of the working paper (*Report on Male Circumcision: An Arguable Method of Reducing the Risks of HIV Transmission*) suggests, the CNS retain uncertainties about the applicability of the study results to the real world and argue that a considerable amount of sociological and anthropological work still needs to be done. The CNS also points out that while in sub-Saharan Africa, the prevalence of HIV generally tends to be higher in regions where the rate of circumcision is lower, this is not universally true. Among the counter-examples cited is Cameroon, where 93 per cent of the population is circumcised. There the HIV prevalence among circumcised men is 4.1 per cent compared with 1.1 per cent among uncircumcised men. In Lesotho, where half of the population is circumcised, the prevalence among circumcised men is 22.8 per cent compared with 15.2 per cent among uncircumcised men. There are, according to the CNS, 'numerous other contradictory examples'.

Notwithstanding this, proponents of male circumcision contend this 'one-time procedure that confers lifelong protection' could avert millions of new HIV infections and deaths over the next 20 years in sub-Saharan Africa (Potts *et al.*, 2008). The saving of so many lives would seem, in the eyes of these commentators, to create an ethical imperative to act; to take appropriate measures to prevent unnecessary and premature death. However, these calculations are disputed by those who argue that the reduction in the number of deaths would be considerably less than stated, and that there are 'better, more cost effective and less risky strategies available' (Kalichman *et al.*, 2007; Green *et al.*, 2008). The CNS(2007) is also sceptical about the claim that male circumcision 'confers lifelong protection', stating that

Transmission of the virus by an infected woman to a non-infected man is a random event whose cumulative probability over 12 months, assuming repeated exposure, is between 10% and 20%. In the case of repeated exposure, even though the circumcised man is less at risk of contracting any possible infection, the phenomenon of repetition will eventually lead to him becoming infected too—although it will take longer.

The debate continues to rage (Morris *et al.*, 2012b; Darby and van Howe, 2011), but what is apparent from all of this is that the actual benefits of real-world circumcision policies to provide lifelong protection against HIV transmission currently are disputed. While the most recent data indicates that for those entered into clinical trials adult circumcision significantly reduces the rate of HIV acquisition for at least 2 years after the procedure (Auvert *et al.*, 2011), sceptics remain. The editor of the South African Medical Journal recently questioned proposals for a massive roll out of voluntary male medical circumcision:

The significance of the evidence from the three African randomised controlled trials (RCTs) is not at issue. However, this evidence seems to have acquired considerable interpretation creep along the way, with inferences of 'lifelong protection' . . . that are not self-evident from the RCTs (Ncayiyana, 2012).

What appears not to be in contention is that circumcision, at best, provides partial protection for males against acquiring HIV through heterosexual vaginal intercourse, and that the use of condoms remains essential when abstinence or fidelity cannot be realized. In addition, despite calls for the roll out of male medical circumcision to entail mass MIC, it remains uncertain whether infant circumcision confers the same benefits that the adult procedure is proposed to provide.

Circumcision and Children in a Low HIV Prevalence Environment

The CNS unequivocally states that 'male circumcision as a means of risk reduction is aimed solely at countries with high prevalence'. This opinion is contrary to Cooper and colleague's contention that mass MIC should be implemented in low prevalence countries in order to prevent a HIV epidemic. Their argument appears to be set out along the following lines:

- (1) Being infected with HIV is a bad thing. In sub-Saharan Africa, it leads to much suffering and premature death.
- (2) Circumcision significantly reduces the rate of HIV seroconversion in heterosexually active males in this environment.
- (3) It is therefore a good idea to circumcise sexually active males in sub-Saharan Africa.
- (4) It is a better idea to do this before males in this region become sexually active, and best of all to

perform the procedure on infants because it is cheaper and associated with less side-effects.

- (5) If MIC is a good thing to do in Africa, it is also a good thing to do in other countries, even those countries with a low HIV prevalence.

The first premise would seem unarguable. As we have seen, the second and third remain debated, but even if we accept them it is not self-evident that premise (4) automatically follows. The association between MIC and HIV status is unclear, and while infant circumcision may be protective, considerable work needs to be done in order to demonstrate that this is so. As pointed out by the CNS, there is significant disparity between the rates of MIC and HIV status in individual countries, and this would seem to require some form of reasoned and reasonable socio-anthropological explanation. Even given this, it is a leap to get to (4). It is one thing to suggest that sexually active males in hyperendemic countries might avail of a procedure that might reduce the possibility of their becoming HIV positive because they engage in risky heterosexual contact. It seems a different proposition to argue that infants should be circumcised because it is a less costly procedure, and while it might decrease the prevalence of HIV in the future, it denies to them the possibility of minimizing their risk of HIV acquisition through undertaking safer sexual activity while remaining genitally intact. It requires still further argument to justify mass MIC in those who are born in a country with a relatively low incidence of heterosexually acquired HIV and to whom there is a low risk in the first place.

Performing an international comparative analysis is beyond the scope of this article, but it is worth examining the proposal in the context of a single low prevalence environment. The number of new cases of HIV infection in the UK seems to be falling, the figure most recently peaking at 7914 in 2005 and gradually declining to 6364 in 2010 (Health Protection Agency, 2012: Table A).² The number of cases where the infection was deemed to have been acquired through heterosexual contact also declined between 2005 and 2010, from 4870 to 3180 (Health Protection Agency, 2012: Table 2).³ Of those infected through heterosexual contact in 2010, 1227 were men, this mode of transmission thus accounting for approximately 28 per cent of male HIV cases. The majority of these infections originated overseas (predominantly Africa) rather than being contracted domestically in the UK.⁴ It has been calculated that heterosexual HIV-infected individuals without major risks for HIV acquisition (those who do not report injecting drug use, sex between men (if male), any

partners with these risks, heterosexual intercourse abroad or sexual partners from an area with high HIV prevalence) represent only about 3 per cent of all HIV infections acquired through heterosexual intercourse diagnosed in the UK (Gilbart *et al.*, 2006). In a low prevalence country, it has been estimated that the lifetime risk of HIV acquisition in a heterosexual who does not engage in intravenous drug abuse is approximately 0.02 per cent (AIDS Action Council, 2009). Whether voluntary male circumcision would be particularly effective in this environment is unknown. The prevalence of adult males circumcised in the USA is substantially higher than in the UK, yet the prevalence of HIV positive males is also higher.⁵ Again, this is not to say that circumcision is ineffective, but the disparity would seem to require explanation before a circumcision programme be undertaken. What also would seem important is that a proper comparative analysis of the relative benefits and burdens of surgical and other forms of HIV prevention be conducted.

Since what has been proposed by Cooper *et al.* (2010) is a mass MIC campaign, and parents would be required to sign a consent form, many might ask what benefit is likely to accrue to the child while still a child. It is notable that current data indicate that in the UK less than 1 per cent of heterosexually infected males are under 19 years of age (Health Protection Agency, 2012: Table 8).⁶ This equates to approximately 12 new cases per year, all of which seem to occur between the ages of 15 and 19 years. If MIC were to reduce the incidence of heterosexually acquired infection by a magnitude similar to that which appears to be provided by the African adult trials, and all male infants were circumcised, then the number of minors infected every year in the UK would fall to 6, or perhaps even 4. Any reduction is to be welcomed, but at what cost?

If we imagine that the governments of England and Wales, Scotland and Northern Ireland were to decide that from 2014 that all male infants would be circumcised and a boy, John, is born in 2014. John will be among approximately 405,000 boys circumcised that year (assuming a static birth rate, this number being based on live UK male birth rate for 2010) (Northern Ireland Statistics and Research Agency, 2011; Office for National Statistics, 2011; General Register Office for Scotland, 2011). By the time John is 19 years old almost 8 million boys will have been circumcised. There are no figures available on the current prevalence of infant circumcision in the UK, but data from the WHO indicate that it is low, and so we may assume that the majority of the 8 million circumcisions are procedures that would not have occurred absent a policy

implementation. Based on the current situation, the risk of heterosexually acquired HIV to children between the ages of 0 and 14 years is essentially zero, and the annual risk from 15 to 19 is approximately 0.000006. Assuming the current rate of circumcision was to remain constant, the cumulative risk of an uncircumcised John becoming HIV positive through heterosexual contact in childhood and adolescence is about 1 in 33,750. If we assume none are circumcised and circumcision would confer a 50 per cent benefit, then six cases of adolescent HIV could be prevented per year. If the universal infant circumcision policy was to be implemented then 67,500 male infants would need to be circumcised in order to produce one adolescent beneficiary.

What kind of number is required for a particular intervention for the advantages to outweigh the costs? In terms of fiscal costs, the price of an infant circumcision under local anaesthesia provided by one NHS trust (on a not for profit basis) is £120 (NHS Tower Hamlets, 2011). Assuming that all infants were to be circumcised under local anaesthesia (the cost under general anaesthesia approaches £900), then the annual expenditure (leaving aside any costs associated with staff recruitment and training, and facility provision to deal with this substantial number of procedures) will be just under £50 million. Whether the intervention will be fiscally efficient or not will depend on the lifetime treatment costs of those who become HIV positive, what these might be in the future and the costs of any other prophylactic methods. Excluding fiscal factors, if every circumcised infant benefitted the argument in favour of MIC might seem compelling. If, for example, circumcision meant that every infant would grow up to be absolutely protected against heterosexually contracted HIV, then circumcision would seem a good thing. On the other hand, if there were no benefit for any of the children, then the exercise would seem futile. What the data indicate is that while still in the age of minority, a lot of circumcisions will be performed for very limited adolescent gain. In addition, there are harms associated with the procedure. Assuming an arbitrary, but not unreasonable, rate of complications to be 1 per cent, then in excess of 4000 children annually will suffer some form of adverse event as a consequence of the procedure. In short, if all infant males in the UK were circumcised, then this surgical procedure would be to the benefit of very few adolescents and possibly to the detriment of a substantially greater number.

However, it could be argued that this view of individual benefits and burdens accruing to children fails to take into account a collective right to public health.

Annually there are 1200 newly infected heterosexual men, and a substantial number of women who would not become HIV positive if the number of HIV positive men was lower. Disaggregating the potential prophylactic benefits of male circumcision to the circumcised individual and to the public health can place a different perspective on the matter. If circumcision is effective, then introducing it on a mass basis is liable to reduce the pool of infected males in the community. This in turn is likely to have a positive impact on the number of female partners exposed to HIV. Thus, rather than framing the central challenge of public health as consisting of weighting individual liberties (or right to be protected from unwarranted interventions) against health outcomes, this alternative perspective obliges us to maximize the human right to health and to tackle systematic disadvantage (Gostin and Powers, 2006). However, what this would seem to commit us to is the provision of easy access to prophylactic measures (including readily available information, condoms and perhaps, circumcision) and effective treatment. On this account, all children and adults should be educated with regard to choices and risks, and prophylactic material and procedures be available to sexually active individuals. This does not straightforwardly lead us to the position where we should institute a programme of mass MIC. Instead, given that: (i) the procedure poses risks to infants, (ii) there is no compelling evidence available indicating that circumcision, performed on neonates, will meaningfully affect the rate of HIV transmission to heterosexually active males in the UK, and (iii) whatever benefit there is largely accrues to individuals as adults (and a very small number of male adolescents), the intrusion seems unwarranted and difficult to justify. Despite the apparent dismissal by some of human rights issues in this regard (Morris, 2007), it would be, at best, morally problematic to operate on hundreds of thousands of male infants each year for little benefit.

However, it is reasonable to suggest that rather than inflicting unnecessary risk and pain upon unconsenting infants, if adult males wish to protect themselves against HIV and yet have no inclination towards abstinence or practicing safe sexual techniques, then as a matter of practicality they should consider having themselves circumcised. Given that no heterosexually acquired HIV infection was reported as occurring in any male under 15 years in 2010, and that it is probable that most consenting sexually active males over this age are likely to be competent with regard to comprehending the nature and purpose of a prophylactic circumcision, then it would seem logical to leave the decision as to whether or not to have a circumcision to the individual when old

enough to decide. One presumes that underpinning Cooper *et al.*'s concern is that adolescent or adult males in developed countries, when provided with the statistical data and conflicting opinions, might be reluctant to submit themselves to a painful surgical procedure. However, the refusal of adolescents or adults to participate in this endeavour would seem insufficient moral grounds to move the risk onto a more vulnerable population.

While mass MIC programmes might be unreasonable in the UK, what about hyperendemic countries? There is a significant difference between the UK and, for example, South Africa, where the number of heterosexually transmitted HIV cases diagnosed daily equals the annual UK total (UNAIDS, 2009). It is clear that radical efforts are required to reduce the spread of HIV in South Africa. Yet, even in that environment, mass MIC is controversial. Within South Africa, it is argued that there is no clear relationship between group (tribal) MIC status and HIV prevalence (Ncayiyana, 2012). Notwithstanding those sceptical of the data from the clinical trials, the evidence base for the benefits and cost effectiveness of adult circumcision is far greater than the evidence for performing the procedure on infants. If we believe the human right to bodily integrity is important then, even in a situation where there is an imperative to engage in a public health strategy to reduce the terrible burden of widespread HIV transmission, it is important that we act according to sound human rights and evidence-based principles. As such, if circumcision is to be promoted, it makes more sense to carry it out on the population where the evidence of benefit is greatest, and where the procedure can be carried out on those capable of giving informed consent.

An account of pro-circumcision policies and social justice in the specific context of HIV/AIDS policy in Africa recently has been given elsewhere (Fox and Thomson, 2012). Disentangling the various interests in order to give a more nuanced view of what social justice might entail in this instance, Fox and Thomson conclude that although the prevention of HIV transmission is a desirable goal, it is unreasonable to impose the burden and risk associated with male circumcision on infants. This, they argue, is because the medical benefits of the procedure are insufficiently proven to warrant performing it on infants, and that scant attention is paid by proponents of MIC to the rights of infants to be treated as moral equals with an interest in 'maintaining physical and bodily integrity and psychological inviolability' (citing Powers and Faden, 2006).

There are some possible difficulties with this position. Two-thirds of HIV-infected people worldwide live in sub-Saharan Africa, with women and girls being at particularly high risk. Those aged between 15 and 24 years account for nearly half of all new infections worldwide, and females in this age group are more than twice as likely to be infected than are males (Baird *et al.*, 2012). It has been proposed that the prevention of HIV in girls is the primary challenge to reach a turning point in the epidemic (Temin and Levine, 2010). On this basis, given that circumcision might reduce the HIV positive male pool and thus diminish the risk of infection to women, it might be argued that male circumcision should be implemented as a tool to protect women, particularly since factors such as power and gender inequality are significant determinants of young women's vulnerability to HIV infection. If women are relatively powerless within a social structure that exposes them to the risk of HIV because of the sexual habits of men, then it seems reasonable to propose that this risk is diminished through available interventions, including circumcision. Perhaps one could plausibly argue that in order to protect the human rights of African women as much as possible all males in sub-Saharan Africa should be circumcised, and in infancy, if that is the cheapest and most effective method.

However, important determinants of women's risk relate to poor education, poverty and inequality (Pettifor *et al.*, 2012). Thus, empowering women through policies that elevate their status in a society, change attitudes among men, enhance education and provide means of independent income for women in order to reduce dependency on males, would seem strategies that not only would reduce women's risk of contracting HIV (Pettifor *et al.*, 2012) but would improve their lot overall. In the public health drive to minimize HIV transmission, investment in maximizing women's capabilities would seem an important element. In this context, education has been declared to be a 'social vaccine' (Jukes *et al.*, 2008). It is arguable that the implementation of effective 'social vaccines' would obviate the need for 'surgical vaccines'.

Circumcision as a 'Vaccine'

One aspect of Cooper *et al.*'s (2010) proposal to carry out mass MIC on infant Australian boys was their suggestion that performing this procedure be 'considered a "surgical vaccine" against future sexually transmitted HIV'. This contention 'attracted strong criticism' from some readers of the *Medical Journal of*

Australia (Letters to the Editor, 2011: 97). Cooper *et al.* (2011: 101) responded robustly:

In our editorial we, just as other academic experts in various countries, likened infant male circumcision to a “surgical vaccine”. Both vaccination and male circumcision effectively, safely and inexpensively afford lifelong protection against a wide array of adverse, sometimes fatal, medical conditions. Both are most effective if provided early in life. Both are criticised vigorously and relentlessly by opponents.

It is worth considering this analogy. Labelling MIC as a vaccine is likely to create a particular public perception and give parents who have their children standardly inoculated against a variety of infections reason to consider seriously circumcision as just another immunisation. When people have to make a decision, where the risk/benefit ratio is unclear or controversial, evidence suggests that they generally resort to heuristics in order to divine which choice is ‘best’ (Serpell and Green, 2006). Into that mix inevitably will go media reports, and the article by Cooper *et al.* identifying circumcision as a ‘vaccine’ was widely reported in both the print and visual media in Australia. The mathematics of circumcision as HIV prophylaxis is disputed (and interpretation probably beyond most people’s abilities) and thus straightforward messages like that offered by Cooper and colleagues may be influential. From the passage quoted above, the correspondence between vaccination and circumcision is dependent on efficacy, safety, cost, lifelong protection and, peculiarly, objections by opponents. The question is whether these are necessary and/or sufficient properties to meet the definitional characteristics of a vaccine.

The term vaccine is etymologically rooted in *vacca*, the Latin word for cow. In 1798, Edward Jenner published a small book entitled *An Inquiry into the Causes and Effects of the Variolae Vaccinae*, detailing how he had inoculated individuals with material from third-party cowpox (*vaccinia*) pustules to protect them from the altogether more serious and fatal disease, smallpox. Jenner decided to call this new procedure vaccine inoculation or vaccination. In general, the term refers to the administration of antigenic material to a person in order to stimulate an immunological response to a disease pathogen (Stern and Markel, 2005). This antigenic material, or vaccine, may come in a variety of forms, including live attenuated or killed pathogens, toxoids and proteins. The resultant vaccine-mediated protection occurs through complex pathways including the induction of antigen-specific antibodies and their persistence, and/or the generation of immune memory

cells. Vaccination is generally considered to be the most effective method of preventing infectious diseases (Siegrist, 2008).

None of the criteria laid down by Cooper *et al.*, however, seems particularly germane to the traditional definition of a ‘vaccine’. Some vaccines are highly (>95 per cent) effective (Yaffe and Aranda, 2011), while some, such as ALVAC and AIDSVAX trialled against HIV are not (31 per cent efficacy) (Rerks-Ngarm *et al.*, 2009). The cost of vaccines is variable (Oxfam/MSF, 2010), their safety hotly disputed (Link, 2005) and not all vaccines provide lifelong immunity (Clark *et al.*, 2012; Grassly *et al.*, 2012; van de Kaa *et al.*, 2007). Yet while standard textbooks of immunology consider many agents as vaccines, none seems to list circumcision. This is unsurprising, because circumcision is not a vaccine in the conventional sense of the word. There seems no greater reason to hold that circumcision is a ‘surgical vaccine’ any more than antibiotics given at the beginning of surgery to prevent infection could be considered as a ‘microbiological vaccine’, or condoms worn during sexual intercourse a ‘latex vaccine’. It is arguable that to extend the term ‘vaccine’ to encompass all preventative measures against disease would seem to broaden its meaning to the point where it lacks utility, and raise the possibility of confusion in an already disputed terrain. Cooper *et al.* might perhaps claim that their use of the term was simply metaphorical rather than literal, but this is unlikely to lessen its public impact. In any case, the analogy is physiologically incorrect. It makes more sense to term circumcision a ‘surgical condom’ rather than a ‘surgical vaccine’, as the form of protection provided is as a physical barrier to the virus rather than through systemic immunological alteration. However, ‘surgical condom’ is, perhaps, a less attractive or persuasive appellation than ‘surgical vaccine’.

Does this matter? In order for a child to undergo a surgical procedure, parents must sign a consent form. For this process to be valid the parents, as proxy decision makers for the child, must possess sufficient information to make the appropriate choice. Informed choice is dependent on both the quality and quantity of pertinent information, and the absence of misrepresentation (Jones, 1999). Labelling circumcision as a vaccine might have some impact on the choices parents make. This may well be the intention of those who wish to term circumcision as a vaccine, perhaps hoping that the uptake of circumcision would come to mirror that of conventional vaccines. In general, most health agencies and governments subscribe to the notion that current scientific knowledge supports the view that standardly

prescribed vaccines reduce the rates of death and disability in children (Nuffield Council on Bioethics, 2007). Responsible organizations then set out to persuade the public that vaccinating children is a good thing to do. Empirical work in Canada has identified the parental decision to vaccinate as being due to three factors: (i) a recognition of the importance of preventing disease; (ii) as a result of a non-questioning attitude towards the recommendations of experts and (iii) feeling pressured because of school policies. The study identified that parents who fully vaccinate appear to have a weaker belief system in their actions than those who do not vaccinate and thus are potentially more susceptible to change (Wilson *et al.*, 2008). The authors caution that while 'current policies appear to be effective in encouraging vaccination, if trust in public health falters, many who currently support vaccination may reevaluate their position.'

The Nuffield Council, citing the MMR example, emphasize the importance of accuracy in both the description of scientific data and its dissemination (Nuffield Council on Bioethics, 2007). Communications that confuse the public about the nature and purpose of vaccination might potentially adversely affect other paediatric public health measures and, as a consequence, population health. There are three potential outcomes that adding a 'HIV circumcision vaccine' to the standard vaccination schedule might have with regard to infant vaccination in general: the proposal might increase overall vaccination rates, decrease rates or have no effect. While it is not possible to divine the outcome of any future event with perfect accuracy, it is difficult to put forth a case that adding a 'HIV circumcision vaccine' to the this schedule is likely to increase overall vaccine uptake, particularly if parents are informed of the limited benefit it offers to children *qua* children in terms of HIV prevention. Some parents are already sceptical about the risk-benefit ratio of conventional vaccines. Serpell and Green point out that '(p)arents are repeatedly exposed to the orthodox scientific view and a proportion of them not only do not believe it but do not trust the sources providing it.' The possible misrepresentation of a surgical procedure as an effective vaccine seems unlikely to improve trust.

Conclusions

One of the difficulties faced by public health is achieving the balance between concern for population-based health and its potential to impose a burden on individuals in 'ethically troublesome ways' (Kass, 2001: 1776). Kass proposed that where liberty is infringed the onus of

proof lies with those in power to demonstrate that the intervention will succeed although, as Coggon (2012) notes, success in terms of health improvements alone does not necessarily indicate acceptability. In addition to benefit, the likely burden of a programme and an assessment of where that burden will fall most heavily, are important considerations:

In balancing values and interests, the greater the burden imposed by a program, the greater must be the expected public health benefit, and the more uneven the benefits and burdens (that is, burdens are imposed on one group to protect the health of another), the greater must be the expected benefit. Programs that are coercive should be kept to a minimum, should never be implemented when a less restrictive program would achieve comparable goals, and should be implemented only in the face of clear public health need and good data demonstrating effectiveness (Kass, 2001: 1776).

Thus, the most burdensome programs should be instigated only if the benefits are substantial and almost certain to accrue. Still, reasonable people might disagree over the details of what represents substantial benefit and what constitutes a significant burden. In this particular instance, individuals might differ, not so much whether the prevention of HIV transmission is an important benefit, but rather over how much of a burden those who will not be afflicted (because of their adoption of personal precautionary measures) should have to bear. One might plausibly argue that it cannot be predicted at birth who will behave in a risky manner and who will not, and thus all male children should be circumcised. However, this would represent a significant infringement of the bodily integrity of infants in return for a very small reduction in the incidence of adolescent HIV.

Adolescent and adult men choose whether to abstain, be faithful or wear condoms during heterosexual intercourse or not, thus either exposing themselves to risk or protecting themselves from sexually transmitted infection. They can also choose to be circumcised if they wish in order to reduce the risk of HIV transmission. However, there are less burdensome options available including the avoidance of multiple or at risk partners and the use of condoms. Although condoms, unlike the circumcised penis, are not always present during coitus, nonetheless their use is always recommended whether the man has been circumcised or not.

There are countries where the impact of HIV is considerably greater than others. This is not to understate either the importance of the disease in low prevalence

environments nor the individual tragedy that each infection might represent. Rather it is a recognition of the fact that HIV poses different levels of population health threat in different regions of the world, and thus proposals that seem reasonable in one environment may be less apposite in another. Circumcision may indeed have a significant role to play in the prevention of HIV transmission. However, the currently available data fail to provide sufficient moral or medical reasons to support the implementation of a mass MIC programme in a low prevalence country such as the UK. Instead, as a practical measure, the procedure should be reserved for those old enough to consent to it.

Acknowledgements

I am grateful for the comments of John Coggon and Paul Snelling on earlier drafts.

Conflict of interest

None declared

Notes

1. See, for example, the symposia editions of the *Journal of Medical Ethics* (2004: 30) and the *American Journal of Bioethics* (2003: 3).
2. The figure in 2011 was lower again (5594). As population statistics from 2010 are the most recent available, the 2010 HIV data are used in this article.
3. 2990 in 2011.
4. Less than one-third of infections were calculated to have been contracted in the UK in 2010.
5. It seems that a number of American medical bodies might echo this call for male infants to be circumcised in response to the African data on HIV transmission. However, the USA already has a high rate of male circumcision (75 per cent of non-Jewish and non-Muslim men (over 15 years old) being circumcised), but a calculated prevalence rate of HIV three to six times that of Australia (WHO/UNAIDS, 2007a; Centers for Disease Control and Prevention, 2012). The benefits of increasing the number of circumcised males in light of this are uncertain at best, particularly since males acquiring HIV through heterosexual contact represent only 11 per cent of new male cases in the USA.
6. None were under 15 years of age.

References

- AIDS Action Council. (2009). *HIV/AIDS and Circumcision in Australia*, available from: http://aidsaction.org.au/content/hiv_sti_health/circumcision.php [accessed 10 November 2012].
- American Academy of Pediatrics. (2012). *Circumcision Policy Statement*, available from: <http://pediatrics.aappublications.org/content/early/2012/08/22/peds.2012-1989> [accessed 30 August 2012].
- Arie, S. (2010). Circumcision: Divided We Fall. *British Medical Journal*, **341**, 370–371.
- Askola, H. (2011). Cut–Off Point? Regulating Male Circumcision in Finland. *International Journal of Law, Policy & Family*, **25**, 100–119.
- Auvert, B., Sobngwi-Tambekou, J., Cutler, E., Nieuwoudt, M., Lissouba, P. and Puren, A. (2009). Effect of Male Circumcision on the Prevalence of High Risk Human Papillomavirus in Young Men: Results of a Randomized Controlled Trial Conducted in Orange Farm, South Africa. *Journal of Infectious Disease*, **199**, 14–19.
- Auvert, B., Taljaard, D., Rech, D., Lissouba, P., Singh, B., Shabangu, D., Nhlapo, C., Otchere-Darko, J., Mashigo, T., Phatedi, G., Taljaard, R., Tsepe, M., Chakela, M., Mkhwanazi, A., Ntshangase, P., Billy, S. and Lewis, D. (2011). *Effect of the Orange Farm (South Africa) Male Circumcision Roll-Out (ANRS-12126) on the Spread of HIV*, 6th IAS Conference on HIV Pathogenesis, Treatment and Prevention. Abstract available from: <http://pag.ias2011.org/Abstracts.aspx?AID=4792> [Accessed 10 November 2012].
- Bailey, R. C., Moses, S., Parker, C. B., Agot, K., Maclean, I. and Krieger, J. N. (2007). Male Circumcision for HIV Prevention in Young Men in Kisumu, Kenya: A Randomised Controlled Trial. *Lancet*, **369**, 643–656.
- Baird, S. J., Garfein, R. S., McIntosh, C. T. and Özler, B. (2012). Effect of a Cash Transfer Programme for Schooling on Prevalence of HIV and Herpes Simplex Type 2 in Malawi: A Cluster Randomised Trial. *Lancet*, **379**, 1320–1329.
- BBC News. (1 October 2001). *Sweden Restricts Circumcisions*, available from <http://news.bbc.co.uk/2/hi/europe/1572483.stm> [accessed 25 March 2012].
- BBC News. (26 June 2012). *German Court Rules Circumcision is ‘Bodily Harm’*, available from: <http://www.bbc.co.uk/news/world-europe-18604664> [accessed 27 June 2012].

- Belluck, P. (2011). Obstacles Slow an Easy Way to Prevent H.I.V. in Men. *New York Times*, 26 September 2011. Available from: <http://www.nytimes.com/2011/09/27/health/27circumcision.html?pagewanted=all&r=0> [accessed 10 November 2012].
- Ben, K., Xu, J., Lu, L., Lü, N., Cheng, Y., Tao, J., Liu, D., Min, X. and Cao, X. (2009). Male Circumcision is an Effective 'Surgical Vaccine' for HIV Prevention and Reproductive Health. *Zhonghua Nan Ke Xue*, **15**, 395–402 (in Chinese).
- Benatar, D. and Benatar, M. (2003). How not to Argue about Circumcision. *American Journal of Bioethics*, **3**, W1.
- British Medical Association (BMA). (2003). *The Law and Ethics of Male Circumcision: Guidance for Doctors*. London: BMA.
- Centers for Disease Control and Prevention. (2012). *Estimated HIV incidence in the United States, 2007–2010. HIV Surveillance Supplemental Report*, 17. Available at <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/#supplemental> [accessed 23 December 2012].
- Clark, T. A., Messonnier, N. E. and Hadler, S. C. (2012). Pertussis Control: Time for Something New? *Trends in Microbiology*, **20**, 211–213.
- Coggon, J. (2012). *What Makes Health Public?* Cambridge: Cambridge University Press.
- Conseil National du SIDA (CNS). (2007). *Report on Male Circumcision: An Arguable Method of Reducing the Risks of HIV Transmission*. Paris. Available from: http://www.cns.sante.fr/IMG/pdf/2007-05-24_rap_en_politique_internationale.pdf [accessed 29 June 2011].
- Cooper, D., Wodak, A. D. and Morris, B. (2010). The Case for Boosting Infant Male Circumcision in the Face of Rising Heterosexual Transmission of HIV. *Medical Journal of Australia*, **193**, 318–319.
- Cooper, D., Wodak, A. D. and Morris, B. (2011). In Reply. *Medical Journal of Australia*, **194**, 101.
- Darby, R. and Van Howe, R. S. (2011). 'Not a Surgical Vaccine': There is no Case for Boosting Infant Male Circumcision to Combat Heterosexual Transmission of HIV in Australia. *Australian and New Zealand Journal of Public Health*, **35**, 459–465.
- Fox, M. and Thomson, M. (2005). A Covenant with the Status Quo? Male Circumcision and the New BMA Guidance to Doctors. *Journal of Medical Ethics*, **31**, 463–469.
- Fox, M. and Thomson, M. (2012). The New Politics of Male Circumcision: HIV/AIDS, Health Law and Social Justice. *Legal Studies*, **32**, 255–281.
- General Register Office for Scotland. (2011). *Vital Events Reference Tables 2010*, available from: <http://www.gro-scotland.gov.uk/statistics/theme/vital-events/general/ref-tables/2010/births.html> [accessed 25 April 2012].
- Gilbart, V. L., Mercer, C. H., Dougan, S., Copas, A. J., Fenton, K. A., Johnson, A. M. and Evans, B. G. (2006). Factors Associated with Heterosexual Transmission of HIV to Individuals Without a Major Risk within England, Wales, and Northern Ireland: A Comparison with National Probability Surveys. *Sexually Transmitted Infections*, **82**, 15–20.
- Godbole, P., Duffy, P., Boddy, S.-A., MacKinnon, E., Bailie, A., Wheeler, R., Thomas, M. and Patil, K. (2007). *Management of Foreskin Conditions. Statement from the British Association of Paediatric Urologists on behalf of the British Association of Paediatric Surgeons and The Association of Paediatric Anaesthetists*, available from: www.baps.org.uk/documents/Circumcision_2007 [accessed 29 February 2012].
- Gostin, L. O. and Powers, M. (2006). What Does Social Justice Require For The Public's Health? Public Health Ethics and Policy Imperatives. *Health Affairs*, **25**, 1053–1060.
- Grassly, N. C., Jafari, H., Bahl, S., Sethi, R., Deshpande, J. M., Wolff, C., Sutter, R. W. and Aylward, R. B. (2012). Waning Intestinal Immunity After Vaccination With Oral Poliovirus Vaccines in India. *Journal of Infectious Disease*, **205**, 1554–1561.
- Gray, R., Kigozi, G., Serwadda, D., Makumbi, F., Watya, S. and Nalugoda, F. (2007). Male Circumcision for HIV Prevention in Men in Rakai, Uganda: A Randomised Trial. *Lancet*, **369**, 657–666.
- Green, L. W., McAllister, R. G., Peterson, K. W. and Travis, J. W. (2008). Male Circumcision is not the HIV 'Vaccine' We Have Been Waiting For! *Future HIV Therapy*, **2**, 193–199.
- Health Protection Agency. (2011). *HIV in the United Kingdom: 2011 Report*. London: Health Protection Services.
- Health Protection Agency. (2012). *United Kingdom: New HIV Diagnoses to End of June 2012*. London: Health Protection Services.
- Jones, M. (1999). Informed Consent and Other Fairy Stories. *Medical Law Review*, **7**, 103–134.

- Jukes, M., Simmons, S. and Bundy, D. (2008). Education and Vulnerability: The Role of Schools in Protecting Young Women and Girls from HIV in Southern Africa. *AIDS*, **22**, S41–S46.
- Kalichman, S., Eaton, L. and Pinkerton, S. (2007). Circumcision for HIV Prevention: Failure to Fully Account for Behavioral Risk Compensation. *PLoS Medicine*, **4**, e138.
- Kass, N. (2001). An Ethics Framework for Public Health. *American Journal of Public Health*, **91**, 1776–1782.
- Klausner, J., Wamai, R., Bowa, K., Agot, K., Kagimba, J. and Halperin, D. (2008). Is Male Circumcision as Good as the Vaccine We've Been Waiting For? *Future HIV Therapy*, **2**, 11–17.
- KNMG. (2010). *Non-therapeutic Circumcision of Male Minors*, available from: <http://knmg.artsenet.nl/Diensten/knmgpublicaties/KNMGpublicatie/Nontherapeutic-circumcision-of-male-minors-2010.htm> [accessed 30 June 2011].
- Letters to the Editor. (2011). The Case for Boosting Infant Male Circumcision in the Face of Rising Heterosexual Transmission of HIV... and Now the Case Against. *Medical Journal of Australia*, **194**, 97–101.
- Link, K. (2005). *The Vaccine Controversy: The History, Use, and Safety of Vaccinations*. Westport, CT: Praeger.
- Morris, B. J. (2007). Why Circumcision is a Biomedical Imperative for the 21st Century. *Bioessays*, **29**, 1147–1158.
- Morris, B. J., Wodak, A. D., Mindel, A., Schrieber, L., Duggan, K. A., Dilley, A., Willcourt, R. J., Lowy, M., Cooper, D. A., Lumbers, E. R., Russell, C. T. and Leeder, S. R. (2012a). Infant Male Circumcision: An Evidence-Based Policy Statement. *Open Journal of Preventive Medicine*, **2**, 79–92.
- Morris, B., Bailey, R., Klausner, J., Leibowitz, A., Wamai, R., Waskett, J., Banerjee, J., Halperin, D., Zoloth, L., Weiss, H. and Hankins, C. (2012b). A Critical Evaluation of Arguments Opposing Male Circumcision for HIV Prevention in Developed Countries. *AIDS Care*, **24**, 1565–1575.
- Ncayiyana, D. J. (2012). Voluntary Male Medical Circumcision—Dan Ncayiyana Responds. *South African Medical Journal*, **102**, 125–126.
- NHS Tower Hamlets. (2011). *Religious and Cultural Male Circumcision Service*, available from: <http://www.towerhamlets.nhs.uk/your-services/sexual-health/?locale=en> [accessed 10 November 2012].
- Northern Ireland Statistics and Research Agency. (2010). *Registrar General Northern Ireland Annual Report 2010*. Belfast: NISRA.
- Nuffield Council on Bioethics. (2007). *Public Health: Ethical Issues*. Cambridge: Cambridge Publishers.
- Office for National Statistics. (2011). *Births and Deaths in England and Wales, 2010*. London: ONS.
- Oxfam/MSF. (2010). *Giving Developing Countries the Best Shot: An Overview of Vaccine Access and R&D*, available from <http://www.oxfam.org/en/policy/giving-developing-countries-best-shot-vaccine-access> [accessed 12 July 2011].
- Paranthaman, K., Bagaria, J. and O'Moore, É. (2011). The Need for Commissioning Circumcision Services for Non-Therapeutic Indications in the NHS: Lessons from an Incident Investigation in Oxford. *Journal of Public Health*, **33**, 280–283.
- Pettifor, A., McCoy, S. I. and Padian, N. (2012). Paying to Prevent HIV Infection in Young Women? *Lancet*, **379**, 1280–1281.
- Potts, M., Halperin, D. T., Kirby, D., Swidler, A., Marseille, E., Klausner, J. D., Hearst, N., Wamai, R. G., Kahn, J. G. and Walsh, J. (2008). Reassessing HIV Prevention. *Science*, **320**, 749–750.
- Powers, M. and Faden, R. (2006). *Social Justice*. New York: Oxford University Press.
- Queensland Law Reform Commission. (1993). *Circumcision of Male Infants Research Paper*, available from: <http://www.cirp.org/library/legal/QLRC/> [accessed 1 July 2012].
- Reks-Ngarm, S., Pitisuttithum, P., Nitayaphan, S., Kaewkungwal, J., Chiu, J., Paris, R., Premisri, N., Namwat, C., Souza, M. d., Adams, E., Benenson, M., Gurunathan, S., Tartaglia, J., McNeil, J. G., Francis, D. P., Stablein, D., Bix, D. L., Supamit Chunsuttiwat, Khamboonruang, C., Thongcharoen, P., Robb, M. L., Michael, N. L., Kunasol, P. and Kim, J. H. for the MOPH-TAVEG Investigators. (2009). Vaccination with ALVAC and AIDSVAX to Prevent HIV-1 Infection in Thailand. *New England Journal of Medicine*, **361**, 2209–2220.
- Royal Australasian College of Physicians (RACP). (2010). *Circumcision of Infant Males*, <http://www.test.racp.edu.au/page/policy-and-advocacy/paediatrics-and-child-health> [accessed 30 June 2011].
- Serpell, L. and Green, J. (2006). Parental Decision-Making in Childhood Vaccination. *Vaccine*, **24**, 4041–4046.
- Sidler, D., Smith, J. and Rode, H. (2008). Neonatal Circumcision Does Not Reduce HIV/AIDS

- Infection Rates. *South African Medical Journal*, **98**, 762–766.
- Siegfried, N., Muller, M., Deeks, J., Volmink, J., Egger, M. and Low, N. (2005). HIV and Male Circumcision—A Systematic Review with Assessment of the Quality of Studies. *Lancet Infectious Diseases*, **5**, 165–173.
- Siegfried, N., Muller, M., Deeks, J. and Volmink, J. (2009). Male Circumcision for Prevention of Heterosexual Acquisition of HIV in Men. *Cochrane Database of Systematic Reviews*, CD003362.
- Siegrist, C.-A. (2008). Vaccine Immunology. In: Plotkin, S. A., Orenstein, W. A. and Offit, P. A. (eds), *Vaccines*. Philadelphia: Saunders Elsevier, pp. 17–36.
- Stern, A. M. and Markel, H. (2005). The History of Vaccines and Immunization: Familiar Patterns, New Challenges. *Health Affairs*, **24**, 611–621.
- Taddio, A. and Katz, J. (2005). The Effects of Early Pain Experience in Neonates on Pain Responses in Infancy and Childhood. *Paediatric Drugs*, **7**, 245–247.
- Tasmania Law Reform Institute. (2009). *Issues Paper No. 14: Non-Therapeutic Male Circumcision*, available from: http://www.utas.edu.au/__data/assets/pdf_file/0003/283701/CircumcisionIssuesPaperA4toPrint.pdf [accessed 10 November 2012].
- Tasmania Law Reform Institute. (2012). *Final Paper No. 17: Non-Therapeutic Male Circumcision*, available from: http://www.utas.edu.au/__data/assets/pdf_file/0006/302829/Non-Therapeutic-Circ_Final-Report-August-2012.pdf [accessed 10 November 2012].
- Temin, M. and Levine, R. (2010). *Start with a Girl: A New Agenda for Global Health*. Washington DC: Center for Global Development.
- The Local. (25 July 2009). *Swedish Doctors Refuse to Circumcise Boys*, available from: <http://www.thelocal.se/20900/20090725/> [accessed 15 December 2010].
- The Local. (14 December 2010). *Man Jailed for Illegally Circumcising Young Boys*, available from: <http://www.thelocal.se/30836/20101214/> [accessed 15 December 2010].
- UNAIDS. (2009). *Country Situation Report: South Africa*, available from: http://www.unaids.org/ctrysa/AFRZAF_en.pdf [accessed 10 November 2012].
- UNAIDS. (2012). *Global AIDS Progress Report. Country Progress Report 2012: Australia*, [http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/ce_AU_Narrative_Report\[1\].pdf](http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/ce_AU_Narrative_Report[1].pdf) [accessed 10 November 2012].
- van de Kaa, D. J., Cohen, C., White, J. M., Savage, E. J., Glynn, J. R., Choi, Y., Andrews, N., Brown, D. and Ramsay, M. E. (2007). Vaccine Effectiveness Estimates, 2004–2005 Mumps Outbreak, England. *Emerging Infectious Diseases*, **13**, 12–17.
- Weiss, H. A., Larke, N., Halperin, D. and Schenker, I. (2010). Complications of Circumcision in Male Neonates, Infants and Children: A Systematic Review. *BMC Urology*, **10**, available from: <http://www.biomedcentral.com/1471-2490/10/2> [accessed 29 February 2012].
- Wisoyonge, C. S., Kongnyuy, E. J., Shey, M., Muula, A. S., Navti, O. B., Akl, E. A. and Lo, Y.-R. (2011). Male Circumcision for Prevention of Homosexual Acquisition of HIV in Men. *Cochrane Database of Systematic Reviews*, **6**, CD007496.
- WHO/UNAIDS. (2007a). *Male Circumcision: Global Trends and Determinants of Prevalence, Safety and Acceptability*. Geneva: WHO.
- WHO/UNAIDS. (2007b). *New Data on Male Circumcision and HIV Prevention: Policy and Programme Implications*. Geneva: WHO.
- Williams, N. and Kapila, L. (1993). Complications of Circumcision. *British Journal of Surgery*, **80**, 1231–1236.
- Wilson, K., Barakat, M., Vohra, S., Ritvo, P. and Boon, H. (2008). Parental Views on Pediatric Vaccination: the Impact of Competing Advocacy Coalitions. *Public Understanding of Science*, **17**, 231–243.
- Yaffe, S. J. and Aranda, J. V. (eds) (2011). *Neonatal and Pediatric Pharmacology: Therapeutic Principles in Practice*. 4 edn. Philadelphia: Lippincott, Williams & Wilkins.