

Testing times: do new prenatal tests signal the end of Down syndrome?

Robert Cole, Gareth Jones

Abstract

Since 2010, prenatal screening for Down syndrome (DS) has been offered to all pregnant women in New Zealand. The programme has been criticised by several groups, on claims that screening is eugenic and discriminatory towards those with DS. Recently, tests have been developed that may one day prove more efficient than current screening methods. They are an example of 'Non-Invasive Prenatal Diagnosis' (NIPD), which enables diagnosis earlier in pregnancy with less risk of complications. If the current programme raises objections, what threats does this new and seemingly more attractive technology pose to the DS community?

We argue that NIPD is simply an extension of current screening methods, raising similar ethical concerns. Presently, the programme shows little evidence of 'eugenics', demonstrated by moderate uptake rates and varying attitudes towards disability. We do not regard the offer of screening to be threatening, as women choose whether or not to be screened depending on their own personal circumstances. One day, prenatal testing may result in fewer people with DS; but past and present trends indicate these individuals will continue to be supported, irrespective of 'group size'. Care and respect for the disabled will remain essential, regardless of a woman's decision over her pregnancy.

In October 2011 a new prenatal test for Down syndrome (DS) was unveiled in the United States.¹ The test analyses proportions of fetal DNA in maternal plasma to give a risk estimate of DS in the fetus. This is an example of 'Non-Invasive Prenatal Diagnosis' (NIPD), which can also detect Trisomies 13 and 18.² Though not specific enough at present, with improvement NIPD could make current prenatal screening and diagnostic methods for DS unnecessary. However, groups such as 'savingdowns.com' believe that New Zealand's current screening process is 'eugenic', discriminating against those with DS by 'the prevention of their births'.³

Further concerns are raised over these new tests, since NIPD has the potential to be used in more pregnancies than with existing screening. Therefore it is timely to ask: what would NIPD mean for the DS community? Furthermore, what does testing, both now and in the future, say about our attitudes towards DS, and disability as a whole?

Since 1968 women have been selectively offered prenatal diagnosis for DS on the basis of advanced maternal age.⁴ This 'opportunistic' method of screening was declared 'unsafe and should not continue', as unnecessary numbers of invasive diagnostic procedures were harming some pregnancies.⁵

In 2010 'quality improvements' were introduced which resulted in New Zealand's current screening programme, which tests for DS and other congenital conditions. The method of screening differs, depending on gestational age.

The majority of screening tests are taken before 14 weeks of pregnancy, via the 'First Trimester Combined Screening' pathway. Here, information on the mother (such as maternal age and smoking status) is combined with a maternal blood test of two serum markers and the results of a Nuchal Translucency (NT) test on ultrasound.

After 14 weeks' gestation 'Second Trimester Maternal Serum Screening' is offered, which utilises information on the mother and the results of four serum markers, without a NT scan. Both of these screening pathways give a numerical risk estimate of congenital malformation in the fetus, which is then conveyed to the patient as either 'low' or 'increased' risk. Throughout the process women are to be reminded that the screening is voluntary, that they can opt out at any time, and that partners and family can be involved in decision-making.⁶

Currently, just over half of all pregnancies receive DS screening, though it is offered to all pregnant women.⁷ Thus there is considerable room for uptake to increase, which may well result from the use of a quick, safe test such as NIPD. The 'quality improvements' of 2010 were developed to provide equality of access and safety for mother and fetus, and NIPD could prove to further fulfil these aims.

Non-invasive prenatal diagnosis

In the case of an 'increased risk' result, two diagnostic techniques can be used to confirm DS (and other genetic abnormalities) in the developing fetus. Chorionic villus sampling (CVS) is used earlier than 14 weeks of gestation, and amniocentesis is used after this time. Both procedures carry with them a spontaneous abortion risk of around 1%.⁴

With current screening most pregnancies subjected to CVS or amniocentesis do not actually have a DS fetus,⁸ and as a result, fetuses are lost as a consequence of these diagnostic procedures. The primary advantage of NIPD is that there is no risk of spontaneous abortion, because diagnosis is based on only a blood sample.

Currently, NIPD has the potential to be used from 10 weeks of pregnancy,² similar to CVS and earlier than amniocentesis.⁹ In the future, NIPD could be used from seven to nine weeks, as fetal DNA is found in maternal blood at a very early gestational age.¹⁰ Results could be obtained more quickly, as current invasive procedures have turnaround times of 1 to 3 weeks.⁶

At present diagnostic results are rarely received before 12 weeks, and often after 17 weeks of gestation,¹¹ leading to late terminations which can be traumatic and (at times) dangerous. An earlier diagnosis would allow women more time for decision-making, and the option of an earlier, safer termination with less emotional and mental repercussions.

It has been reported that women express interest in NIPD, primarily due to the absence of risk of spontaneous abortion.¹² Some women find diagnosis helpful to prepare for the birth of a child with DS,¹³ and NIPD would be preferable to amniocentesis/CVS as there are no major complications.

NIPD may prove more attractive for district health boards, by reducing the number of costly invasive procedures at specialist care centres. For these reasons, NIPD is likely to be used in more pregnancies than current diagnostic procedures at some stage in the

future.¹⁴ Should costs drop and clinical efficacy be proven, NIPD could eventually make current screening methods redundant as well.

But what would NIPD mean for the DS community? Increased uptake of tests will result in increased detection of DS, and probably more terminations. The number of DS births may, as a result, drop. However, it is unlikely that DS will disappear. Abnormalities escape detection using even the most rigorous diagnostic techniques, and there will always be women who do not wish to undergo testing.

But as more pregnancies are tested, will DS become a 'rare' disorder? In time, perhaps. However, the life expectancy of those with DS is increasing, and is likely to soon approximate that of the non-DS population.¹⁵ This will mask, at least temporarily, any effect of NIPD on the prevalence of DS. Hence, even with a rapid increase in the uptake of NIPD, it is unlikely that the numbers of those with DS will change markedly in the near future.

NIPD and current DS screening tests both provide comparable information, and enable similar choices for pregnant women. Because of this, the ethical issues likely to be raised by NIPD will be analogous to those associated with current screening. 'Savingdowns.com', an anti-screening group, argues that a nationwide DS screening programme is simply a money saving exercise, initiated by a government which views individuals with DS as nothing more than a drain on society.³

'Savingdowns.com' claims that the current screening costs '\$75,000 per [terminated] child with Down syndrome'. However, such wording misrepresents what screening provides to the majority of women; namely, reassurance in the case of a 'low risk' result. To evaluate DS screening on the basis of cost-effectiveness is to compare DS to other screened, treatable diseases, such as breast and cervical cancer.

In these cases, a 'cure' is the overall aim. There is no 'cure' for a DS pregnancy, indeed this is not the aim of the test. The test's purpose is to give women information on the pregnancy, not prevent a DS birth. The value of this knowledge to women is impossible to quantify, because the choices it makes possible would otherwise be unavailable. For these reasons cost-effectiveness should not be used to assess DS screening,⁵ despite claims that it is the overall aim.¹⁶

Is screening for Down syndrome 'eugenic'?

Anti-screening groups frequently label the current screening 'eugenic' in nature, making distinct comparisons to the killing of the disabled in Nazi Germany in the 1930s–40s.

This clouds the debate around the ethics involved, since current screening is voluntary, not state-enforced. Patients are given a choice whether or not to be screened, and how to respond to the resulting information.

DS screening does not serve to systematically erase the congenitally disabled from the population; it provides information for patients about their pregnancy.

This is not the start of a 'slippery slope' to Third Reich genocidal acts; as shown below, support and advocacy for the disabled has never been greater. Nevertheless, it is important to ensure that women are never coerced into accepting screening or subsequent termination, and a decision is made which is appropriate for them.

If all pregnant women were persuaded to be screened and unable to make voluntary decisions then eugenic overtones would indeed be present. Such persuasion does not need to be administered by the state; if severe pressure was exerted by health practitioners a form of 'institutionalised eugenics' could still eventuate. Such a practice would require all women, or a large proportion of them, to be coerced in the same way. However, with only 55% of pregnancies utilising DS screening,⁷ this does not appear to be the case.

Thus to argue that the screening programme is 'eugenic' seems inaccurate, as nearly half of all pregnant women are declining the offer of screening. This points to the success of fair, supported choices free from state or medical coercion.

Accusations of 'institutionalised eugenics' are better directed at termination of pregnancy, as up to 90% of women who receive a positive result from CVS/amniocentesis proceed with termination.¹⁷ This number seems high until placed in context: those unlikely to consider termination on the grounds of DS often decline diagnostic testing.

If there remains a suspicion of 'institutionalised eugenics', it is unlikely that any health workforce could unilaterally enforce such a decision on an entire population, for several reasons. Those in the health workforce are far from homogeneous, and have varying perceptions of disability. No longer do patients leave their choices purely in the hands of doctors, while a patient's right to refuse medical treatment is well-recognised and enshrined in law.

Lastly, non-directive counselling has been shown to be beneficial in allowing women to make fair, independent decisions for screening decisions,^{18,19} and is offered to women both before and after diagnostic testing.⁶

There is evidence that a minority of practitioners may attempt to pressure women towards termination of a DS fetus; however, a similar number urges continuation of an affected pregnancy.²⁰

Hence, to argue that the current programme is eugenic is an over-generalisation, even though some health professionals may be unduly persuasive in offering termination. This fault is not implicit within the screening process per se; it points to a flaw in the education of health professionals, where a proportion are inadequately informed about the quality of life of those with DS.¹¹

While DS results in varying levels of intellectual disability, those affected report a consistently high satisfaction with their lives. The vast majority of people with DS feel that they are capable and have self worth, and love their families and friends.²¹

Children with DS are frequently described as being more content, caring and loving than non-DS children. It is incumbent upon obstetricians, GPs and midwives to ensure that information such as this is conveyed to women involved in the screening pathway. With tests such as NIPD likely to be used earlier and more frequently in pregnancy, this becomes increasingly important.

Supporting individuals with Down syndrome

But does the mere offering of a test not subtly imply that DS is undesirable, a 'disease' best avoided? We argue that this is not necessarily the case, although we

recognise that children with DS require more care and support than non-DS children.²² This support is often required throughout life as in most cases a person with DS cannot live fully independently.²³

For some families, raising a child with DS will be immensely difficult, and it is for this reason that we allow the option of termination. This is similar to the option of termination for other serious congenital disabilities, a situation that has prevailed since the 1978 amendment of the Crimes Act in New Zealand.

Society offers a choice, not a routine procedure; it is the woman, not the state, who makes this judgement. The assumption is that women make this choice in regard to their own life circumstances, and not merely because a screening process is offered within the first 20 weeks of pregnancy.

As a consequence of the availability of NIPD and any further tests that may be developed in the future, the numbers of those with DS may fall. However, there is no indication that society will cease to value these groups, even though they number less than in the past.

Disabled persons gained recognition and respect throughout the 20th century, regardless of their group size. Awareness and services for the disabled have grown dramatically²⁴ and funding is set to increase for the near future.²⁵

Some argue that a reduction in number of those with a disability like DS will reduce the standing, recognition and support of such individuals in society.²⁶ This is unsubstantiated, since there is little evidence that society neglects to treat rare disorders because there are few with the condition. For instance, we do not value and support those with DS more than those with Fragile X syndrome, on the grounds that DS is more prevalent. There is no evidence that our care for those with spina bifida is inferior to that of 10 years ago because the incidence of spina bifida has decreased.^{27,28}

We value and treat individuals as persons, supporting them in regards to their needs, not the number who shares their disorder. Along similar lines we will continue to support those with DS, and this is in no way jeopardised by women's decisions for their own pregnancy.

We concurrently offer prenatal screening and value the disabled by upholding several values in society.

First, we value an ethic that stresses the importance of 'doing the most good'. On these grounds we accept that in some cases, the perceived disadvantages resulting from a DS pregnancy (to child and family) may outweigh the perceived good from the child's life.

Second, we value reproductive liberty, the ability to make individual decisions over one's pregnancy. Others, such as the state, are limited in their control of this right. Alongside these we uphold dignity, respect and justice, realising that those who are disabled demand equal respect as citizens, thereby deserving support from society.²⁹

Inevitably, these values must be held in some tension; but as long as they are recognised as important, we will make sure one (e.g. reproductive liberty) never fully undermines another (e.g. respect for the disabled). From this, we can argue for two

compatible viewpoints - that screening is justified, and that the disabled will continue to receive support and respect from society.

The advent of less invasive tests such as NIPD places increasing demands upon our ethical awareness. While NIPD does not automatically lessen the value society places on disabilities such as DS, technological efficiency must never be our sole consideration in the use of such tests. It must be balanced by serious regard for continued, and, if necessary, increasing support for children and adults with these conditions.

It should be noted that NIPD is still in its infancy, with technological advances permitting detection of other conditions, reducing cost, and improving specificity all required before NIPD is likely to be offered as standard care.³⁰

Regardless, should NIPD or tests like it one day replace current screening methods, unwavering advocacy for those with disability will remain of paramount importance.

Competing interests: Nil.

Author information: Robert Cole, BMedSc (Hons) Student; Gareth Jones, Emeritus Professor, Bioethics Centre, University of Otago, Dunedin

Acknowledgements: We gratefully acknowledge the financial support offered by the Health Research Council New Zealand and the Dunedin Faculty of Medicine, without which this work would not have been possible.

Correspondence: Gareth Jones, Bioethics Centre, University of Otago, PO Box 913, Dunedin 9054, New Zealand. Fax: +64 (0)3 4716121; email: gareth.jones@otago.ac.nz

References:

1. Laino C. New Molecular DNA test may help detect Down syndrome. *Neurology Today*. 2011;11(21):57-58.
2. Palomaki GE, Deciu C, Kloza EM, et al. DNA sequencing of maternal plasma reliably identifies trisomy 18 and trisomy 13 as well as Down syndrome: an international collaborative study. *Genet Med*. 2012;14(3):296-305.
3. Conservationists for Down syndrome- Saving the endangered Kiwis. <http://www.savingdowns.com/>
4. Stone P, Austin D. Assessment of Antenatal Screening for Down Syndrome in New Zealand. Auckland, New Zealand: Auckland Uni Services; 2006.
5. Antenatal Down Syndrome Screening in New Zealand 2007. Wellington, New Zealand: National Screening Unit; 2007.
6. Guidelines for Maternity Carers Offering Antenatal Screening for Down Syndrome and Other Conditions in New Zealand. Wellington, New Zealand: Ministry of Health; 2009.
7. National Screening Unit. Antenatal Screening for Down Syndrome and Other Conditions: Summary January to December 2011. <http://www.nsu.govt.nz/news/4807.aspx#4857>
8. Buckley F, Buckley S. Wrongful deaths and rightful lives - screening for Down syndrome. *Downs Syndr Res Pract*. 2008;12(2):79-86.
9. Royal College of Obstetricians and Gynaecologists. Amniocentesis and Chorionic Villus Sampling. London; 2010
<http://www.guideline.gov/content.aspx?id=25665&search=amniocentesis+and+chorionic+villus+sampling>
10. Schmitz D. A new era in prenatal testing: are we prepared? *Med Health Care Philos*: Springer Netherlands; 2012 [online only]

11. Skotko BG. With new prenatal testing, will babies with Down syndrome slowly disappear? *Arch Dis Child*. 2009;94(11):823-826.
12. Tischler R, Hudgins L, Blumenfeld YJ, et al. Noninvasive prenatal diagnosis: pregnant women's interest and expected uptake. *Prenat Diagn*. 2011;31(13):1292-1299.
13. Tymstra TJK. Prenatal diagnosis of Down's syndrome: Experiences of women who decided to continue with the pregnancy. *Int J Risk Saf Med*. 2004;16(2):91-96.
14. Benn PA. Ethical challenges in providing noninvasive prenatal diagnosis. *Curr Opin Obstet Gynecol*. 2010;22(2):128-134.
15. Bittles AH, Glasson EJ. Clinical, social, and ethical implications of changing life expectancy in Down syndrome. *Dev Med Child Neurol*. 2004;46(4):282-286.
16. George G. Screening on slippery slope to eugenics. *New Zealand Herald* 16/09/10; Sect. A. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10673661
17. Mansfield C. Termination rates after prenatal diagnosis of Down syndrome, spina bifida, anencephaly, and Turner and Klinefelter syndromes: a systematic literature review. *Prenat Diagn*. 1999;19(9):808-812.
18. Roberts CD, Stough LM, Parrish LH. The role of genetic counseling in the elective termination of pregnancies involving fetuses with disabilities. *J Spec Educ*. 2002;36(1):48.
19. Sheets K, Crissman B, Feist C, et al. Practice guidelines for communicating a prenatal or postnatal diagnosis of Down syndrome: Recommendations of the National Society of Genetic Counselors. *J Genet Couns*. 2011;20(5):432-441.
20. Wertz DC. Drawing lines: notes for policymakers. In: Parens E, A.A., editor, *Prenatal testing and disability rights*. Washington DC: Georgetown University Press; 2000. pp. 261-287.
21. Skotko BG, Levine SP, Goldstein R. Self-perceptions from people with Down syndrome. *Am J Med Genet A*. 2011;155(10):2360-2369.
22. Barnett WS, Boyce GC. Effects of children with Down syndrome on parents' activities. *Am J Ment Retard*. 1995;100(115-127).
23. Steingass K, Chicoine B, Mcguire D, Roizen N. Developmental disabilities grown up: Down syndrome. *J Dev Behav Pediatr*. 2011;32(7):548-558.
24. Disability in New Zealand: A changing perspective: Ministry of Social Development. <http://www.odi.govt.nz/resources/guides-and-toolkits/disability-perspective/disability-nz.html>
25. Ryall T. \$2.2b extra to boost public health services. <http://beehive.govt.nz/release/22b-extra-boost-public-health-services>
26. Shakespeare T. Back to the future? New genetics and disabled people. *Critical Social Policy*. 1995;15(44-45):22-35.
27. Macaldowie A, Hilder L. *Neural Tube Defects in Australia: Prevalence Before Mandatory Folic Acid Fortification*. Canberra: Australian Institute of Health and Welfare; 2011.
28. Liveborn Cases of Birth Defects Reported to the New Zealand Birth Defects Registry, 2000-2009. In: Registry, N.Z.B.D., editor: *New Zealand Birth Defects Registry*.
29. United Nations Convention on the Rights of Persons with Disabilities. New York; 2006. <http://www.un.org/disabilities/convention/conventionfull.shtml>
30. Benn P, Cuckle H, Pergament E. Non-invasive prenatal diagnosis for Down syndrome: the paradigm will shift, but slowly. *Ultrasound Obstet Gynecol*. 2012;39(2):127-130.