

Poverty and food

## The nutrition puzzle

ROME AND SÃO PAULO

Why do so many people in poor countries eat so badly—and what can be done about it?

IN ELDORADO, one of São Paulo's poorest and most misleadingly named *favelas*, some eight-year-old boys are playing football on a patch of ground once better known for drug gangs and hunger. Although they look the picture of health, they are not. After the match they gather around a sack of bananas beside the pitch.

"At school, the kids get a full meal every day," explains Jonathan Hannay, the secretary-general of Children at Risk Foundation, a local charity. "But in the holidays they come to us without breakfast or lunch so we give them bananas. They are filling, cheap, and they stimulate the brain." Malnutrition used to be pervasive and invisible in Eldorado. Now there is less of it and, equally important, it is no longer hidden. "It has become more visible—so people are doing something about it."

If Eldorado's slum children today eat better, it is partly thanks to José Graziano da Silva. He ran Brazil's *Fome Zero* (zero hunger) campaign, a policy that has helped to cut hunger by more than a third in Latin America's largest country. Now Mr Graziano wants to apply the lessons he has learned more widely: he recently took over as head of the United Nations' Food and Agriculture Organisation (FAO). And he stands a better chance of success than his predecessors. His appointment coincides with a shift in the world's approach to

fighting hunger.

Governments around the world are paying increasing attention to nutrition. In 2010 donors, charities and companies drew up a how-to policy guide called *SUN* (which stands for scale up nutrition). Britain's Department for International Development and other aid agencies are devoting more of their money to nutritional projects. The World Bank has nailed its colours to the mast with a book called "Repositioning Nutrition as Central to Development". Save the Children, an international charity, talks about "galvanising political leadership" behind the effort. Underlying all this is a change in thinking about how best to improve nutrition, with less stress on providing extra calories and food and more on improving nutrition by supplying micro-nutrients such as iron and vitamins.

### A damning record

In the 1960s and 1970s, ending hunger and malnutrition seemed relatively simple: you grew more crops. If the harvest failed, rich countries sent food aid. But the Ethiopian famine of 1984 undermined this approach. Here was a disaster of biblical proportions in a country where food was available. It was a reminder of what an Indian economist, Amartya Sen, had long taught: what really matters with food is not the overall supply, but individual access.

So in the 1990s and early 2000s the emphasis switched to helping people obtain food. This meant reducing poverty and making agricultural markets more efficient. Between 1990 and 2005 the number of people living on less than \$1 a day in poor countries (at 2005 purchasing-power parity) fell by a third to 879m, or from 24.9% of the total population to 18.6%.

Yet the food-price spike of 2007-08 showed that this approach also had limitations. Prices of many staple crops doubled in a year; millions went hungry. The world remains bad at fighting hunger. Experts argue about exactly how many people are affected, but the number has probably held flat at just below 1 billion since 1990.

Even where there is enough food, people do not seem healthier. On top of 1 billion without enough calories, another 1 billion are malnourished in the sense that they lack micro-nutrients (this is often called "hidden hunger"). And a further 1 billion are malnourished in the sense that they eat too much and are obese. It is a damning record: out of the world population of 7 billion, 3 billion eat too little, too unhealthily, or too much.

Malnutrition is attracting attention now because the damage it does has only recently begun to sink in. The misery of lacking calories—bloating bellies, wasted limbs, the lethargy of famine—is easy to spot. So are the disastrous effects of obesity. By contrast, the ravages of inadequate nutrition are veiled, but no less dreadful.

More than 160m children in developing countries suffer from a lack of vitamin A; 1m die because they have weak immune systems and 500,000 go blind each year. Iron deficiency causes anaemia, which affects almost half of poor-country children and over 500m women, killing more than 60,000 of them each year in pregnancy. Iodine deficiency—easily cured by adding the stuff to salt—causes 18m babies each year to be born with mental impairments.

Malnutrition is associated with over a third of children's deaths and is the single most important risk factor in many diseases (see chart). A third of all children in the world are underweight or stunted (too short for their age), the classic symptoms of malnourishment.

The damage malnutrition does in the first 1,000 days of life is also irreversible. According to research published in *The Lancet*, a medical journal, malnourished children are less likely (all things being equal) to go to school, less likely to stay there, and more likely to struggle academically. They earn less than their better-fed peers over their lifetimes, marry poorer spouses and die earlier.

Paradoxically, malnutrition can also cause obesity later in life. In the womb and during the first couple of years, the body adjusts to a poor diet by squirrelling away whatever it can as fat (an energy reserve). It ▶▶

never loses its acquired metabolism. This explains the astronomical obesity rates in countries that have switched from poor to middle-income status. In Mexico, for instance, obesity was almost unknown in 1980. Now 30% of Mexican adults are clinically obese and 70% are overweight. These are among the highest rates in the world, almost as bad as in America. India has an obesity epidemic in cities, as people eat more processed food and adopt more sedentary lifestyles. And with obesity will come new diseases such as diabetes and heart disease—as if India did not have enough diseases to worry about.

Nutrition is also attracting attention because of some puzzling failures. In a few big countries, notably India and Egypt, malnutrition is much higher than either economic growth or improvements in farming would suggest it should be. India's income per head grew more than fourfold between 1990 and 2010; yet the proportion of underweight children fell by only around a quarter. By contrast, Bangladesh is half as rich as India and its income per head rose only threefold during the same period; yet its share of underweight children dropped by a third and is now below India's. Egypt's agricultural value-added per person rose more than 20% in 1990-2007. Yet both malnutrition and obesity rose—an extremely unusual combination.

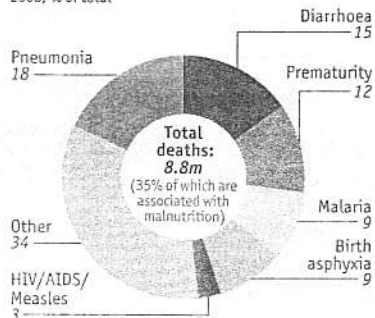
The good news is that better nutrition can be a stunningly good investment. Fixing micro-nutrient deficiencies is cheap. Vitamin supplements cost next to nothing and bring lifelong benefits. Every dollar spent promoting breastfeeding in hospitals yields returns of between \$5-67. And every dollar spent giving pregnant women extra iron generates between \$6-14. Nothing else in development policy has such high returns on investment. In 2008, as part of a project called the Copenhagen consensus, eight prize-winning economists listed the projects they thought would do most good (they had an imaginary \$75 billion to spend). Half their proposed projects involved nutrition.

If malnutrition does so much damage and the actions against it are cheap and effective, why is the affliction only now being taken seriously? Some countries have successfully tackled it. Brazil cut the number of underweight people by 0.7% a year between 1986 and 1996 and reduced stunting by 1.9% a year. Bangladesh reduced both rates by 2% a year in 1994-2005.

But in many countries the problem of "hidden hunger" is hidden from victims themselves, so there is no pressure for change. If everyone in a village is undernourished, poor nutrition becomes the norm and everyone accepts it. This may also explain the reluctance of poor, ill-fed people to spend extra money on food, preferring instead to buy such things as televisions or a fancy wedding. When asked

### The toll of malnutrition

Global deaths of children under 5 by cause 2008, % of total



Sources: WHO; IFPRI

about his spending choices, an ill-fed Moroccan farmer told Abhijit Banerjee and Esther Duflo of the Poverty Action Laboratory, a think-tank: "Oh, but television is more important than food."

Education can help change attitudes by persuading people they would benefit from a better (if more expensive) diet. But people in rich countries consume vast quantities of junk food knowing full well that it is bad for them. It is unrealistic to expect consumers in poor countries to behave differently. Hence the idea of doing good by stealth.

### Just push all the buttons at once

HarvestPlus, a research group, breeds staple crops with extra nutrients and distributes the "bio-fortified" seeds. It released a vitamin A-rich cassava in Nigeria in 2011. This year it will bring vitamin A-rich maize (corn) to Zambia and iron-rich beans and pearl millet to Rwanda and India. Companies do something similar with processed foods: Kraft's Biskuat biscuits (sold in Indonesia) have nine vitamins and six minerals added.

But education or fortified foods alone will not overcome the most intractable barrier to better nutrition, which is the sheer complexity of the task. Some problems of development are relatively straightforward. You can improve education by building schools and paying teachers. Nutrition is not like that.

In many countries nutritional standards vary according to the season. Often both the amount and quality of food drop alarmingly in the months before the main harvest. Nutrition varies also within households. Mothers eat less in bad times to leave more for their older children, which harms the suckling child. Culture adds to the problem. In rural Bangladesh an attempt to improve nutrition by educating young mothers backfired, because the family diet turns out to be determined not by mothers, but by mothers-in-law.

And nutrition can also be improved in all sorts of ways, including by better sanitation, which reduces intestinal diseases

and enables people to absorb more nutrients; by investing in smallholder farming, to increase dietary variety; by vaccinating children against diseases; by educating women to breastfeed babies for longer, to improve immunity. Marie Ruel, of the International Food Policy Research Institute in Washington, DC, ticks off some of the tasks: focus on the first 1,000 days of life (including pregnancy); scale up maternal-health programmes and the teaching of good feeding practices; concentrate on the poor; measure and monitor the problem.

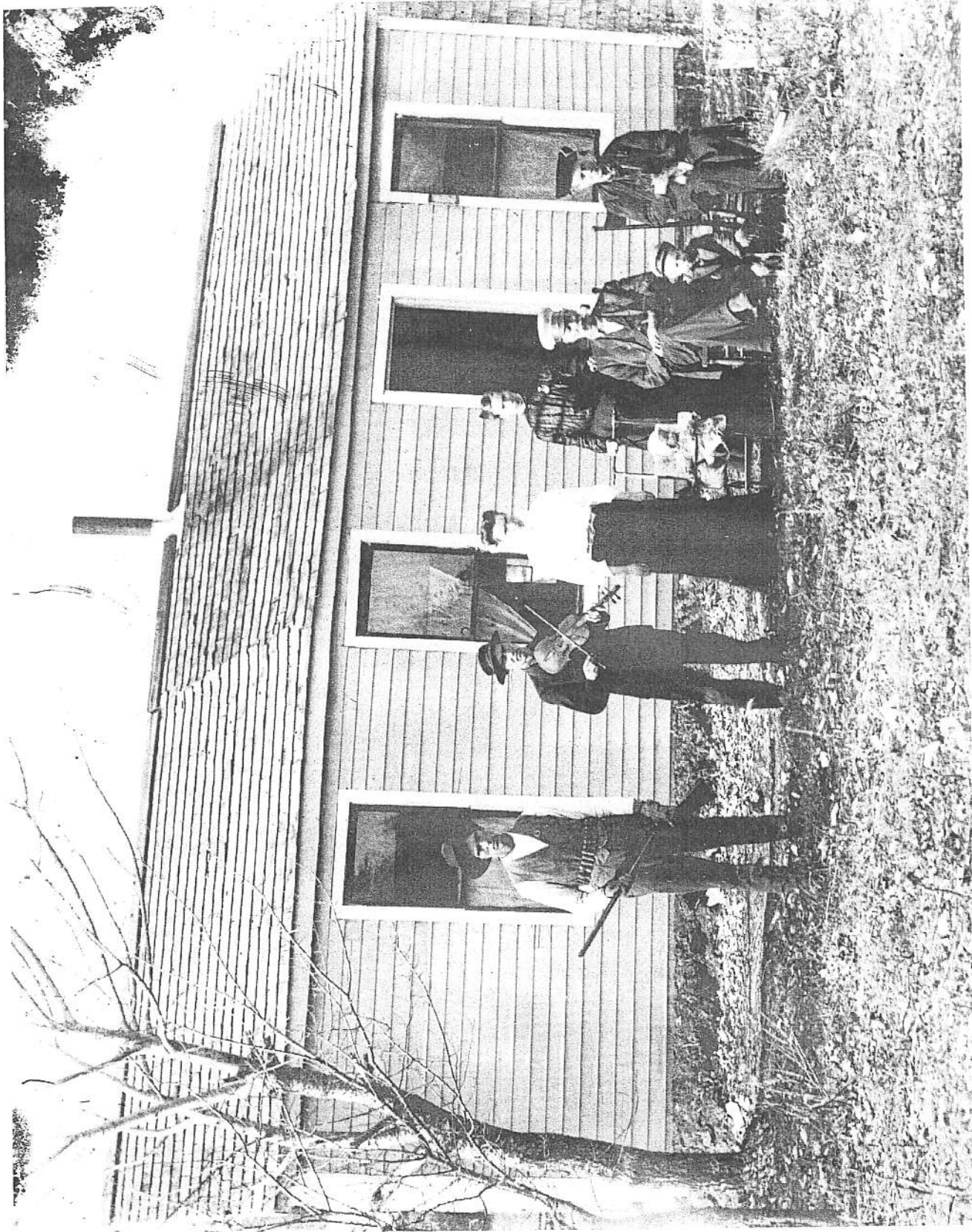
All this implies that a successful effort to improve nutrition has to push all the buttons at once. Brazil's *Fome Zero* has 90 separate programmes run by 19 ministries. It embraces everything from a conditional cash-transfer scheme, called *Bolsa Família*, to irrigation projects and help for smallholders. Such an effort is hard to organise and cannot work unless politicians support it. "Malnutrition reduction needs powerful champions who know how to get things done across government, avoid gobbledygook and finish the story," says Lawrence Haddad, director of Britain's Institute of Development Studies.

Hence the importance of Mr Graziano, the FAO's new boss. Interest in improving nutrition is growing; so is alarm at the failures of fighting malnutrition so far. He will not find it easy to cajole more countries into a large, broad-based effort. Governments are reluctant to change and want clear evidence. And just as the damage from malnutrition builds up over a lifetime, so better nutrition reveals its benefits only over many years, as well-fed mothers pass on good health to well-fed children.

At a recent FAO conference someone was heard to remark that "at the moment nutritionists are in a position similar to environmentalists in the 1990s." That is depressing, because it means progress will be slow; but it is encouraging, because progress will come eventually. ■



Let them eat mangoes



Lesq, Michael Wisconsin Death Trip  
U. New Mexico Press, 1973



is called duration'. Of the immense expanse of past time Newton had no true idea, for he took as gospel the Genesis story. Space was similarly absolute. Newton avoided the colossal scale of space by supposing that God had fixed up the cosmos so that gravity, the force he was the first to quantify, had not made it collapse – at least, so far.

This view held up well until the nineteenth century. By then even atheist scientists had faith in a lawlike order of nature – not from philosophy, but because it worked. Though this assumption springs from an essentially theological worldview, it gave useful predictions without a god attached. Still, few saw the full implications of regarding time as a subject of study, not belief.

The first collision between religious views and the study of the far past, which we now call Deep Time, came with the newborn science of geology. In 1830, the geologist Charles Lyell proposed that the features of Earth perpetually changed, eroding and re-forming continuously, at a roughly constant rate. This challenged traditional views of a static Earth with rare, intermittent catastrophes. In the eighteenth and nineteenth centuries the vast depth of the eras before humans arose became apparent, through development in geology and evolution's grand perspective. These still had to be licensed by physics, the more secure and quantitative science which sets the stage for the events and processes probed by the other sciences.

When William Smith and Sir Charles Lyell first recognised that rock strata represented successive long eras, they could estimate timescales only very imprecisely, since rates of geologic change varied greatly. Even these early attempts got the sciences into trouble. Creationists, reasoning from the Bible, had been proposing dates of around six or seven thousand years for the age of the Earth based on the Bible. Early geologists suggested millions of years for geologic periods, with some even suggesting a virtually infinite age for the Earth. Geologists and palaeontologists constructed geologic history based on the relative positions of different strata and fossils, estimating the timescales based on studying rates of various kinds of weathering, erosion, sedimentation and lithification. The ages of assorted

Charles Lyell.

*Bryson, ed.  
Seeing Further:  
The Story of Science,  
Discovery, and the Genius  
of the Royal Society  
NY: Harper, 2010*



rock strata and the age of the Earth were hotly debated. In 1862, the physicist William Thomson, whose authority endured – as Lord Kelvin and President of the Royal Society – until the end of the century, set the age of Earth at between 24 million and 400 million years. He assumed that Earth began as a completely molten ball of rock, then calculated how long it took to cool to its present temperature. He did not know of the ongoing heat source from radioactive decay.

Physicists had more prestige, but even then, geologists doubted such a short age for Earth. Biologists could accept that Earth might have a finite age, but even 100 million years seemed much too short for evolution to have yielded such complex plenty. Charles Darwin argued that even 400 million years did not seem long enough.

Until the discovery of radioactivity in 1896, and the development of its geological applications through radiometric dating during the first half of the twentieth century (pioneered by geologists), there were no precise absolute datings of rocks.

# An extinct possibility? Study gives new hope to mankind

The Y chromosome is diminished but holding its ground, researchers say

By **NICHOLAS WADE**  
NEW YORK TIMES NEWS SERVICE

Men, or at least male biologists, have long been alarmed that their tiny Y chromosome, once the same size as its buxom partner, the X, will continue to wither away until it simply vanishes. The male sex would then become extinct, they fear, leaving women to invent some virgin-birth method of reproduction and propagate a sexless species.

The fear is not without serious basis: The Y and X chromosomes once shared 800 genes in common, but now, after shedding genes furiously, the Y carries just 19 of its ancestral genes, as well as the male-determining gene that is its *raison d'être*. So much DNA has been lost that the chromosome is a fraction of its original size.

But there are grounds for hope that the Y chromosome has reached a plateau of miniaturized perfection and will shrivel no more. Researchers led by Jennifer Hughes and David Page of the Whitehead Institute in Cambridge, Mass., have reconstructed the Y chromosome's past and find that its gene-shedding days seem to be over. Men are not living on borrowed time after all, they reported Wednesday in the journal *Nature*.

In people, sex is determined

by a single gene that resides on the Y chromosome. Chromosomes come in pairs, with one set bequeathed by each parent, and the Y is paired with X such that men have an X-Y pair and women an X-X. When the male-determining gene first arose, about 320 million years ago, the X and Y were both full-length chromosomes, each bearing the same set of 1,000 or so genes.

## Self-sacrifice

The Y chromosome began its self-sacrificing downsizing in the gallant cause of protecting women. As is well known, the purpose of sex is to exchange DNA between the mother's and father's version of each gene, creating novel combinations that will help children adapt to a new environment better than their parents did. So before generating sperm and eggs, the two members of each pair of chromosomes line up side by side and swap large chunks of DNA.

But the male-determining gene on the Y cannot be allowed to sneak across onto the X because it would insert maleness where it should not be. So a no-swapping zone was created around the male-determining gene. That inhibitory zone was extended in five stages until it covered the whole of Y chromosome except its very tips.

Genes at the tips of the Y exchange DNA with the X in the usual way, but all those in between were condemned to a monklike existence. And being unable to innovate,

most of these genes became first antiquated and then dispensable. The X chromosome now has 790 genes in its no-swap zone, according to best current estimates, but the Y retains a mere 19 of these original genes.

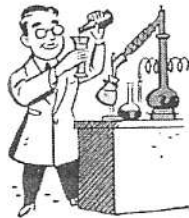
## Y, oh, why?

As the only part of the human genome that never passes through a woman's body, the Y is the ideal refuge for male-favoring genes, especially those having to do with sperm production. Eight such genes have leapt onto the Y from other chromosomes, bringing its total score to 27. But these few additions have not allayed concern about the chromosome's long-term viability.

The Whitehead team's new report provides solid assurance by showing that the Y's shedding of genes is not a continuing process. Almost all of its genetic self-sacrifice occurred in the distant past.

This insight was gained by decoding the Y chromosome of rhesus monkeys, which shared a common ancestor with humans at the time, and retain 20 ancestral genes, meaning those that have a counterpart gene on the X. Only one of these genes has been lost in humans at some time in the past 25 million years, showing that the Y chromosome became essentially stabilized long ago.

"It's my sincere hope that this article might put the notion of the disappearing Y chromosome to rest," Page said.



**Blinding you with science**

It's not often we hear from people in the education field - we mean, besides the librarian at our elementary school, wondering when we're going to return "Fox in Socks" (our answer is: When we find out how it ends!) - so it was a real surprise to hear from Stephanie Jones, who is the fair director of the Northwest Science Expo.

She not only provided this Edge, but she also managed to include a plug for people to volunteer as science fair judges (details at [nwse.org](http://nwse.org)), pointing out that if you can read this Edge you can judge a middle school fair and if you have a degree, a high school competition.

The following are actual project titles competing in science fairs throughout Oregon.

- Woof! Let's Play
- What's up G?
- What Repels or Attracts Slugs More?
- What IS the Difference?
- Watch Your Temper
- Was Lady Gaga Right? Stop Telephoning Me!

- Turbines
- Shmurbines
- Tumbling Toast
- To See or not to See
- To Plug or Unplug
- To Lay or not to Lay, That Is the Question
- To Boulderly Go Where no one Has Gone Before
- The Leak Proof Bag
- The Iron Truth
- The Green Eating Machine
- The Gender Race
- The Forecast Is Sunny With a Chance of Wind
- Texting Talking and Walking
- Teacher, Can I Get Another Day?
- Sticky Gloves
- Sad Shrimp
- Rolling Around
- Robot Replacement
- Release the Hounds
- Red Sox Rule
- My Growing Fish
- Metal Oxs
- Memory Foam
- Horse Pad
- Marshmallows in a Vacuum
- Lotion Potion
- Light up the Night
- La, La, La, La, Click, Click, Click
- It's Ice Ice Baby!
- Ice to Meet You
- I Believe I can Fly!
- Helmet Head
- Great Globbs of Gluten
- Got Water?
- Got Vitamin C?
- Got Milk?
- Got Fish?
- Got Carbon Dioxide?
- Caterpillar Taste Preference
- Beat the Reaper!
- Backpack Attack!
- Are Permanent Markers Really Permanent?
- An Apple a Day



Feb. 13, 2012  
**Education**

Continued from Page One

employees of the governor's education panel, formally titled the Oregon Education Investment Board, have held seven public hearings from Pendleton to Medford, gotten diverse education groups on board, made the rounds of newspaper editorial boards and otherwise convinced key players, Nesbitt said.

Groups from the state teachers union to the conservative business lobby Associated Oregon Industries now say it is important that the bill pass as an early concrete step toward the governor's larger vision for improving Oregon education.

"We welcome the accountability, and we fully embrace setting goals," Sena Norton, a Boring Middle School teacher and Oregon Education Association leader, testified. "Educators believe in accountability and are not afraid of high standards. We should have reciprocal high standards for public officials" to provide funding necessary to get the job done well, she said.

Betsy Earls, an Associated Oregon Industries vice president, noted the businesses in her association employ more than 200,000 Oregonians. "We have a very strong interest in education reform," she said. "Achievement compacts are a critical piece."

Eventually, Kitzhaber hopes to create a seamless, results-oriented early childhood-to-college education system that propels every student to graduate from high school and 80 percent of Oregonians to a higher education credential.

That will require seismic shifts and a lot more money. Currently, more than 25 percent drop out of high school

and only about 40 percent get an associate's degree or higher.

In the 2011 Legislature, Kitzhaber secured broad bipartisan support for his proposals to start that change. But most of the provisions were overarching and structural, with specifics left to be determined later. Some lawmakers and advocates grumbled the package was rushed through with relatively little scrutiny, and it was unclear whether Kitzhaber's more specific follow-up bills would fly.

He proposed two this year: one to begin remaking the landscape of early childhood programs and the second to create achievement compacts and make related changes at schools and colleges.

That bill passed the Senate Education Committee on a 4-1 vote last week. Even the lone "no," Sen. Larry George, R-Sherwood, said favorable things about the governor's plans while expressing concerns that local innovation might be quashed.

By April, it's likely that every school board, community college board and public university president will be weighing the size of measurable achievement gains to pledge to deliver in 2012-13.

For school districts, deliverables could include higher graduation rates, higher third-grade reading scores, more students showing a full year's growth on state tests, more freshmen passing their classes and smaller gaps between white, nondisabled native English speakers and their historically lower-scoring counterparts.

Community colleges and universities could end up pledging to get more students to earn certificates and degrees, graduating more students ready to work in high-wage growth industries and doing more to help local high

encompassing education board. Plans forwarded by Kitzhaber and the board finding broad and fervent support at the Capitol this month. By April, every school district and college could be preparing its first "achievement compact" the state.

MICHAEL LLOYD  
 THE OREGONIAN

school students get a junior college credit.

But that's not decisive. Two subcommittees of the governor's new board have 2½ weeks to recommend specifics of what can and cannot be in the compacts, then in with a broad advisory group for feedback. A final decision is slated for March 13.

There will be no shortcuts for schools or colleges that meet their targets, district or college that fall short would still be funneled the same formulas as successful ones.

But lawmakers, education advocacy groups and business leaders all heaped praise on the idea, saying a focus on results is likely to help in momentum to achieve. And they said achievement targets set by Oregon school districts are likely more meaningful than now dictated by the federal Child Left Behind Law.

Proponents of the grounded part of their optimism on the experience of Salem-Keizer and Tigard schools, both of which outperform districts with similar demographics on key measures and are seeing improvement.

The superintendent of both those districts has testified repeatedly that specifying the key results to achieve has been important to get everyone in the district working toward goals and enabled them to reach those targets.

"We have been public about what we are intending to do and we are coming very close" to meeting all those targets, said Superintendent Rob Kitzhaber. "That really is the power of compacts."

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