

TROUBLE IN PARADISE

A childhood in the Caribbean sounds idyllic, but research on the island of Dominica is uncovering some universal truths about how stress harms children. Meredith F. Small investigates

AT EIGHT o'clock one Tuesday morning, first and second graders in the village of Bwa Mawego on the Caribbean island of Dominica head for school. A line of kids in brown uniforms snakes down the steep road towards a two-room, yellow stucco schoolhouse. Girls, their hair plaited and tied with brightly coloured plastic bows, swing satchels and murmur softly to their friends in lilting Creole. Boys push toy wooden cars on sticks over the bumpy road. The sun sparkles on the Atlantic Ocean below and as the kids reach out and pull bananas off the trees, the villagers wave them along. Childhood in Dominica seems like a slice of paradise.

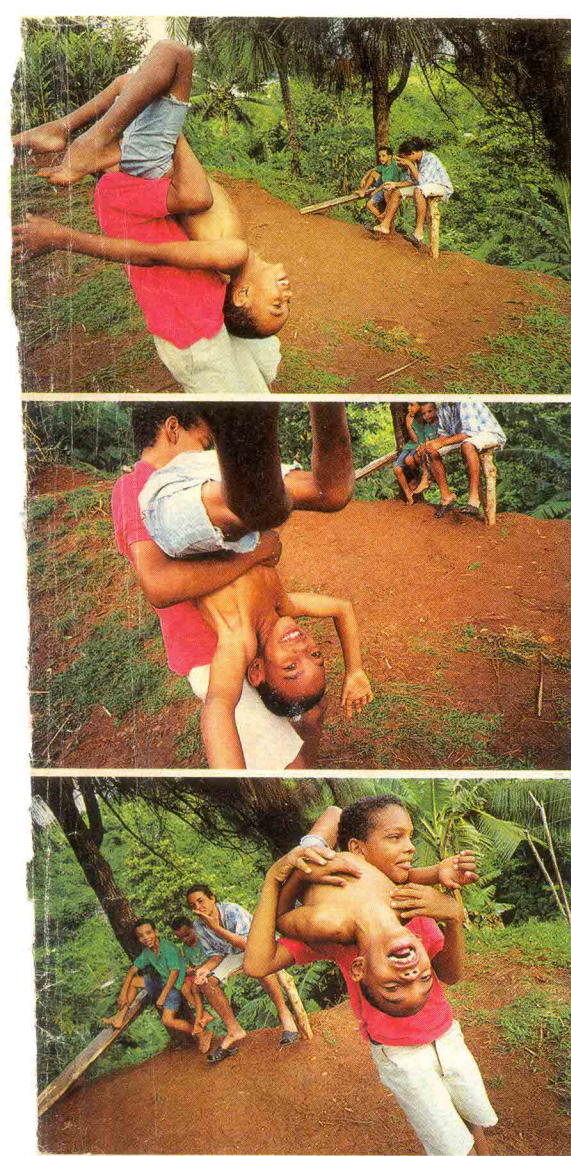
This image is shattered when a loud commotion erupts at the school gate—a child is screaming bloody murder. Seven-year-old Winston runs into the yard followed

by his mother, wielding a stick. She catches him by the shoulder and whacks his bottom, over and over. Her face is stony as the boy screams in pain and fury. "He does not want to go to school," explains the teacher as she ushers the other children inside. In the schoolroom, some show their anxiety by holding hands, others cower in their seats. No one says a word.

Childhood, no matter the setting, has its darker moments. We may expect children to be happy-go-lucky, but in fact their lives are rocked by anxiety. Children as young as eight say they are under stress because of school work and relationships with their peers, according to a British study reported last month. Kids in affluent societies worry about wearing the right designer labels and meeting the expectations of pushy parents. Elsewhere, poverty is at the root of

childhood stress. And around the world there are kids who grow up amid constant violence, either in the home or because of civil war and political strife. Winston's problems with school are common—but he and his classmates are in an unusual position because they are taking part in a unique long-term study to uncover how stress affects their physical and mental wellbeing.

For the past 13 years, anthropologist Mark Flinn from the University of Missouri has been studying the children of Bwa Mawego. His approach may seem subversive to many parents—he encourages the kids to spit. But this is an ideal way to find out what's going on inside their bodies, because saliva contains a hormone called cortisol, which is produced in response to stress. Using this information, together with health records and the children's own



Ups and downs: how do the stresses of family life affect children? Their saliva may hold the answer. Anthropologist Mark Flinn (right, top and bottom) has been asking kids on the Caribbean island of Dominica to spit into cups so he can measure their stress hormones

reports about their daily goings-on, Flinn has been able to get an extraordinary insight into their lives. The research shows which situations provoke most anxiety in kids, and it is also starting to reveal how our experience of stress in early life affects us in adulthood.

When you perceive a threat, cortisol and other hormones kick in to modulate energy output and put the mind and body on alert. This is known as the "fight or flight" response. "Without cortisol," says Flinn, "humans can't endure the ups and downs of everyday life." But the physiological changes associated with stress are designed for coping with emergencies. Sustained over time, they begin to break the body down. For example, the immune system, which is dampened down so that energy can be directed elsewhere, is eventually

damaged. So a response that has evolved to help us deal with incidental threats turns out to be bad when the perceived danger goes on too long.

Persistently high cortisol levels can be especially damaging in children. When stress continues over days, weeks or years, many of their developing systems are put on hold, sometimes causing permanent damage. Unusually high cortisol levels from constant stress slow physical growth, delay sexual maturity and can slow the growth of brain cells. In the short term, stress makes children prone to upper respiratory tract infections and diarrhoea—diseases that can be fatal in the young.

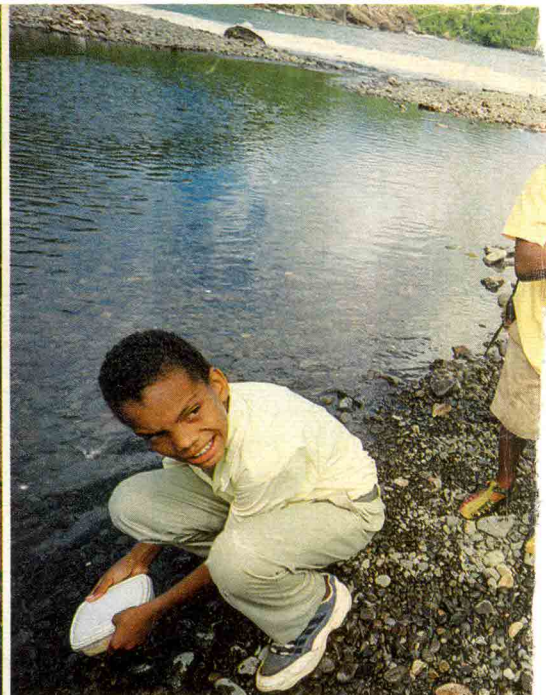
There are also behavioural consequences. Studies of orphans kept in appalling conditions in Romania, who were then adopted by families in the US, show that such

children soon catch up in terms of physical growth and maturation. But those who spent the longest time in the orphanage, without affection or normal social interactions and under great social stress, continue to have major behavioural problems.

Of course, this sort of childhood is not usual, and extraordinary experiences may lead to extreme responses. Yet almost all of what we know about stress in children comes from studies of such shattered lives. Flinn wanted to get the bigger picture. His aim was to look at a group of regular kids, casting his net widely across family dynamics and over generations to understand how each child navigates life's emotional rollercoaster.

Flinn arrived on Dominica in 1988, hoping to find a culture where he could observe children on a daily basis. It seemed

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Keeping track: Flinn spends his days visiting children at their home or out and about. As he collects his saliva samples, he asks the children about their home life, school, friends and health



like an ideal setting. The island is home to 700 or so people of mixed African, Carib and European descent who occupy about two hundred houses clustered into five hamlets. "You could never do this kind of study in a typical Western urban environment," says Flinn. City children spend their time inside homes or school and families are more guarded about their behaviour, but in Bwa Mawego life is lived in the open. "I know hundreds of people here," he says. "Back home, I don't even know my neighbours."

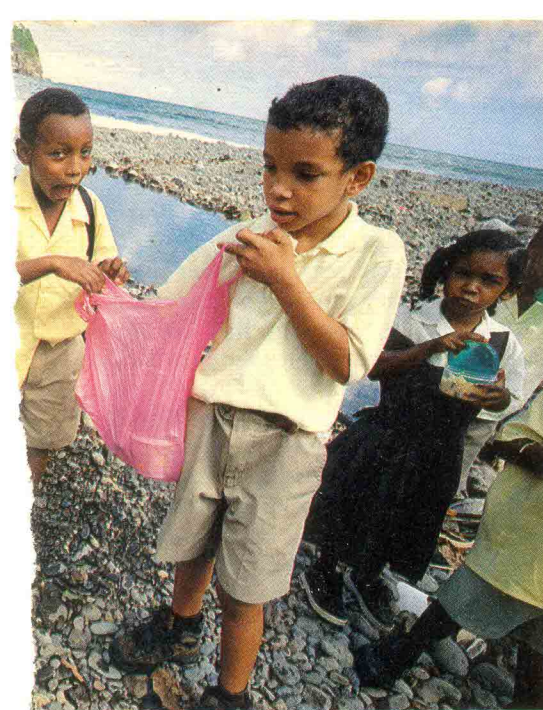
Flinn knew that if he could measure cortisol in the local kids he would have some idea of their levels of stress. So he and his assistants spend their days visiting individual households or stopping kids on the road and asking them to rinse their mouths

with water, chew on a stick of gum to produce saliva, and then spit into a cup. And while the kids are doing this, he asks about their home life, school, friends and health. He then sends the samples to his colleague Barry England at the University of Michigan Hospitals in Ann Arbor, who measures the levels of cortisol and looks for other chemicals known as immunoglobulins that indicate stress and health. Today Flinn has over 25,000 samples from 287 children aged between 3 months and 18 years. On average, each child has spat into a cup 96 times.

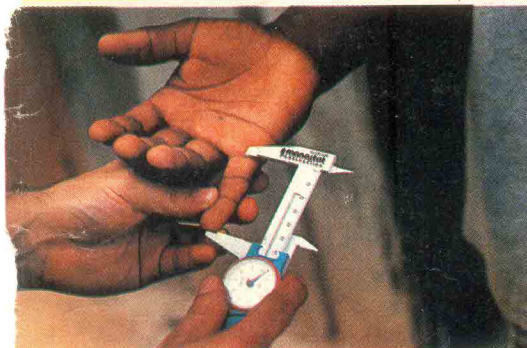
After 13 years of spending many months each year gathering biological data and being absorbed into life on Dominica, the message from Flinn's research is surprising. Social ills such as the hardships of poverty, competition in school and interactions

with peers don't stress children much. A run-in with friends, for example, often does not raise cortisol levels at all. But what really does affect them is family issues. Over and over again, Flinn has found that when a family experiences some sort of trauma—father and mother have a fight, father leaves, or grandmother hits a kid—there is a physiological effect on the children. Their cortisol levels rise and stay high. And a few days later they get sick.

The message that home life has the power to rock children was recently echoed by neuroendocrinologist Sonia Lupien of McGill University in Montreal. She collected a sample of saliva from 217 urban schoolchildren in Canada on two separate mornings. As expected, Lupien found that children from low socioeconomic households had higher



The long view: the study's 13-year duration means Flinn has been able to follow many children into adulthood. Some seem to have been permanently affected by stressful events that happened while in the womb or during early childhood



cortisol levels than their more affluent peers—three times as high. But she concludes that it is not just economics per se that affects children, but the atmosphere at home. Her psychological tests and interviews with 139 of the children's mothers revealed that those with low socioeconomic status were more likely to suffer from depression. And she suspects that this partly accounts for their children's stress levels.

The people of Dominica are also poor, but here what particularly affects the kids is the comings and goings of their parents in search of work. Fathers typically go off-island at harvest time to find jobs on farms in the US or Canada, and mothers may work away from the village at tourist resorts. At any time, kids might live with their biological parents, step-parents, grandparents,

or in houses with various relatives. In a typical year, perhaps a third of all households with children change composition at least once. Analysis of the kids' saliva shows that when a mother or father leaves for a few days—even when the trip is expected—cortisol levels rise. Usually they return to normal within no more than a day if the trip is short and expected, but longer absences can result in protracted responses, with the possibility of long-term physiological and behavioural consequences.

Of course, individual children may respond differently to the same situation. Personality and temperament play a role in how people perceive threat, so an experience that might seem frightening to one kid might be considered normal by another, and this will be reflected in their cortisol

levels. But by monitoring fluctuating hormone levels throughout the day, Flinn is able to identify trends and patterns. He has found, for example, some intriguing difference between the responses of boys and girls. Girls between the ages of 9 and 16 are much more affected by the absence of their mother than are boys of this age. And infant boys—but not girls—respond to the absence of their father with abnormally low cortisol levels and slow growth.

One of Flinn's most disturbing findings is that no matter how often parents fight or leave home, the kids react just as strongly every time. Unlike adults, who adapt psychologically to a repeated stressful situation, children always react as if they were encountering it for the first time.

This makes evolutionary sense, as Flinn

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Tough times: fathers often leave the family to find temporary work in the US, and mothers often seek work in tourist resorts. The children's stress levels leap upward every time a parent goes away

points out. Human young are dependent on their carers to help them navigate through their crucial early years. So to get the emotional and physical help they need, they must be highly sensitive to the behaviour of their carers—and that makes them particularly vulnerable to family strife. Several studies have shown that it's unpredictability that really stresses kids. British researchers found, for example, that the cortisol levels of some children are lower at school, where life is predictable and stable, and higher at home, where they

believe anything can happen.

Normally, their reaction to stress helps kids cope by directing energy to parts of the body that need it most, but if stressful situations are not resolved, the damage can be far-reaching. Megan Gunnar, an expert on stress in children at the Institute of Child Development at the University of Minnesota, points to a growing awareness that stress in childhood is a major mental and physical health risk.

"One reason to worry about stress in childhood is that this is the time when we learn how to manage stress—patterns that we will carry forward into our adult lives," says Gunnar. "And we don't take the hit on some of the health consequences until we are older. Increasingly, we are finding that many of those adult diseases that knock us down when we are 40 or 50—heart disease, high blood pressure and so on—are detectable in childhood, when the patterns are set."

Gunnar and others have shown that when very young children are abused, neglected or bond poorly with their carers, their cortisol levels are high even in mildly stressful situations such as play, and they are unable to cope. And several recent studies of women who had been abused as children show that they are biologically vulnerable to depression and anxiety as adults because early experiences permanently altered their hormonal responses, making them hypersensitive to stress.

Flinn has uncovered two abnormal patterns of cortisol production in children under continued stress from family trauma. Usually, kids have a constant low background level of cortisol, which peaks when they are under stress. But some highly stressed children have chronically high levels of cortisol. They are also shy and anxious. Another group of children has

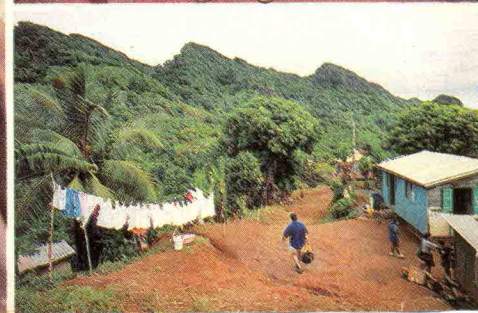
abnormally low basal cortisol levels interspersed with spikes of unnaturally high levels. They also show what Flinn calls "blunted" cortisol responses—their levels don't rise as they should during physical activity. Just as worrying, they are less sociable and more aggressive than kids with normal profiles.

Some of these kids have been stressed since they were conceived, and they probably missed certain sensitive periods for obtaining normal cortisol profiles, though how exactly the response develops is still unknown. These children also have weakened immune responses, fall ill more frequently, are easily fatigued and don't sleep well. Looking at his record of children who are now adults, Flinn is finding that some of them seem to be permanently affected by stressful events that happened while they were in the womb, in infancy or during early childhood.

But despite the comings and goings of their parents, Flinn suspects that the children of Bwa Mawego may be less susceptible to family stress than children in the West. In the Caribbean, and most other less industrialised regions, families are bigger, more tightly connected, and more involved in the lives of their children than the typical nuclear family. So when it comes to dealing with stress, these poor kids may be richer than children in affluent nations.

"We have a ton to learn about kin networks and family," says Flinn. "We take our system for granted—that's how it is so that's how it should be'. It's not informed by cross-cultural information, not informed by evolutionary theory. Not informed by anything." □

Meredith F. Small is a professor of anthropology at Cornell University. Her book, *Kids: How Biology and Culture Shape the Way We Raise Our Children*, will be published in April 2001 by Doubleday.



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