Appendix

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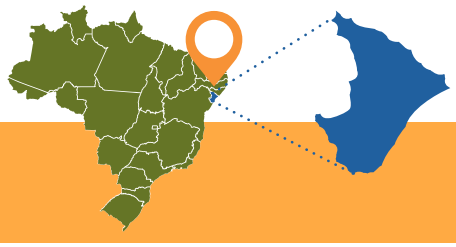
Appendix

HCI in selected Brazilian municipalities

Aracaju, Sergipe



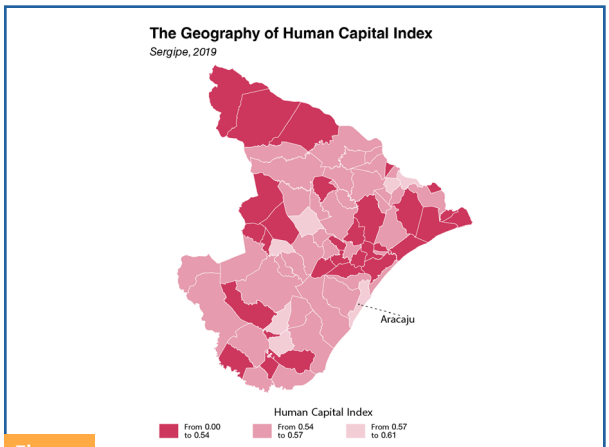
Human Capital Index: 0.586

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Aracaju had an HCI of **0.586** in 2019. This means that the future productivity of a child born in this year was, on average, **58.6%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Aracaju** had insufficient performance. The municipality occupies the **22nd** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Aracaju's** per capita income would be **70.8%** higher if human capital was fully promoted.



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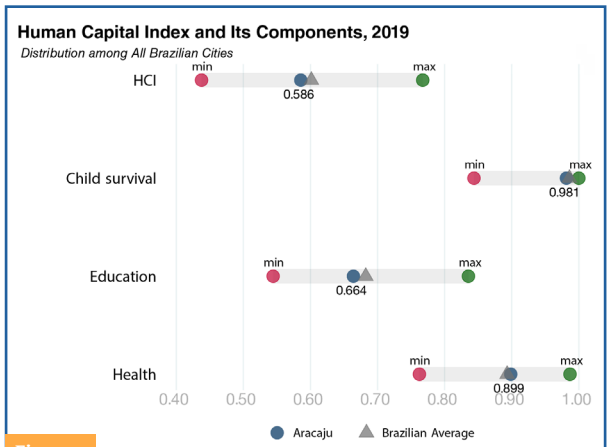

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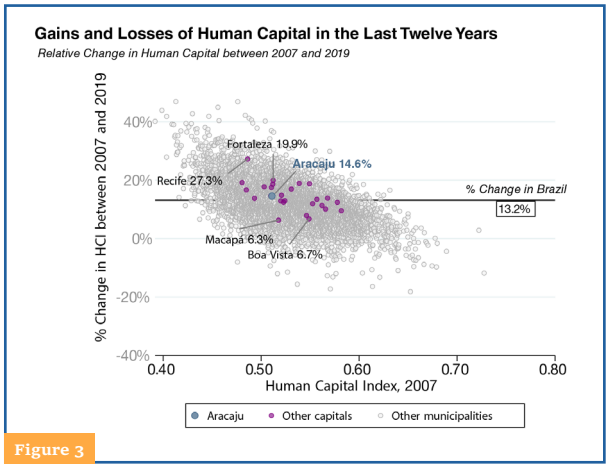

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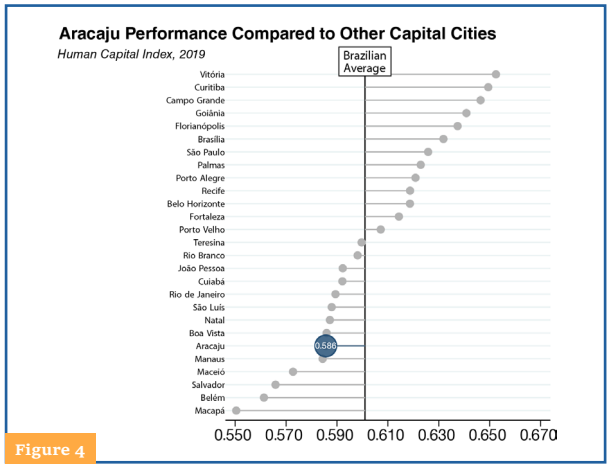
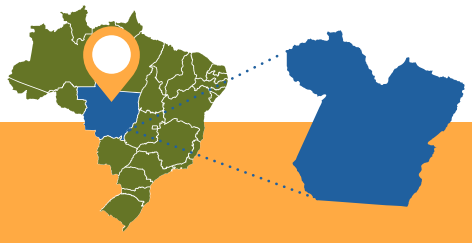


Figure 4

Average in Brazil	Aracaju's rank in Brazil	Aracaju's rank in Sergipe
0.601	3,268th	5th

Belém, Pará



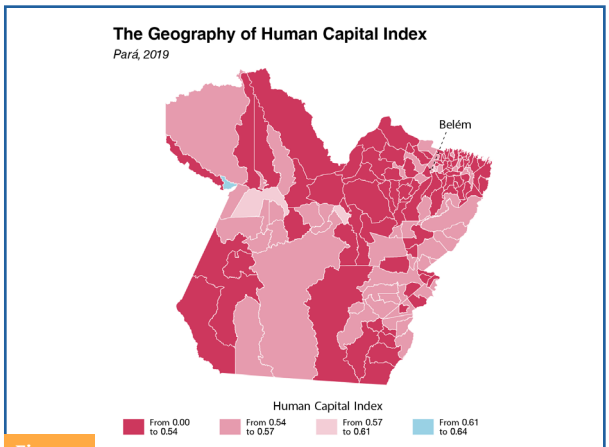
Human Capital Index: 0.561

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Belém had an HCI of **0.561** in 2019. This means that the future productivity of a child born in this year was, on average, **56.1%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Belém** had insufficient performance. The municipality occupies the **26th** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Belém's** per capita income would be **78.2%** higher if human capital were fully promoted.



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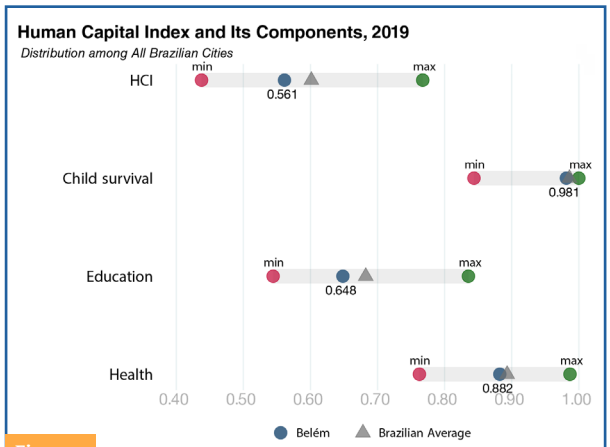

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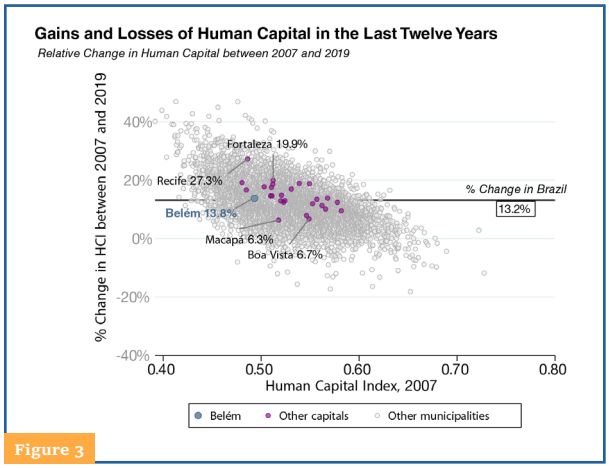

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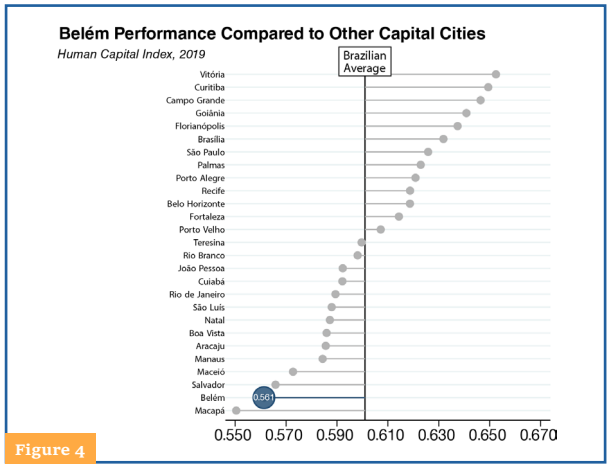
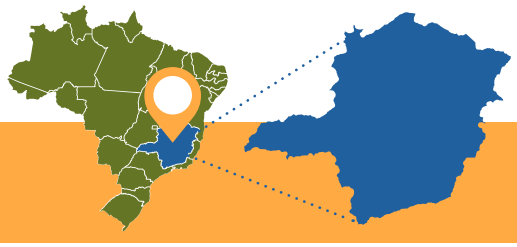


Figure 4

Average in Brazil	Belém's rank in Brazil	Belém's rank in Pará
0.601	4,160th	17th

Belo Horizonte, Minas Gerais



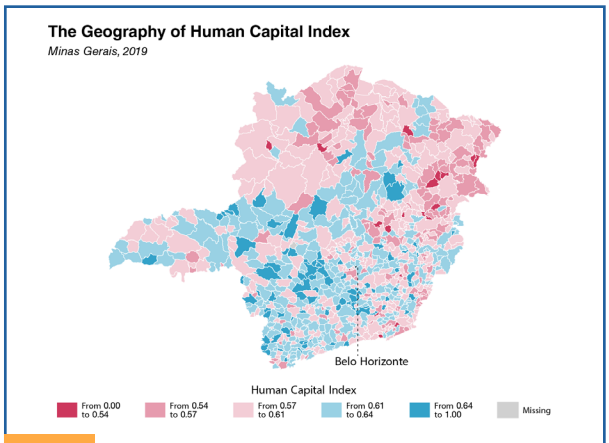
Human Capital Index: 0.619

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions for human capital accumulation.

Belo Horizonte had an HCI of **0.619** in 2019. This means that the future productivity of a child born in this year is, on average, **61.9%** of its potential. This value was above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Belo Horizonte** had satisfactory performance. The municipality occupies the **11th** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth below the national average in recent years *(fig. 3)*. Belo Horizonte's per capita income would be **61.6%** higher if human capital were fully promoted.



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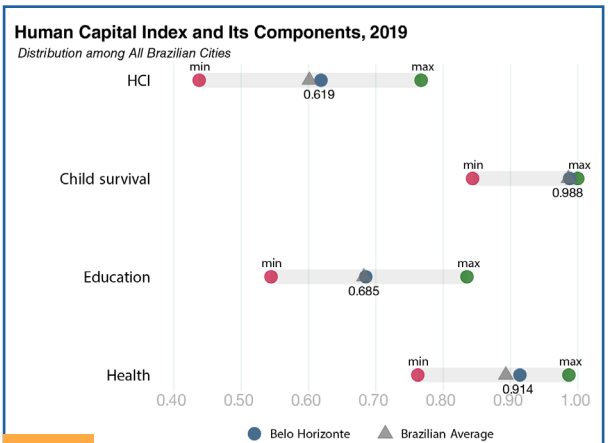

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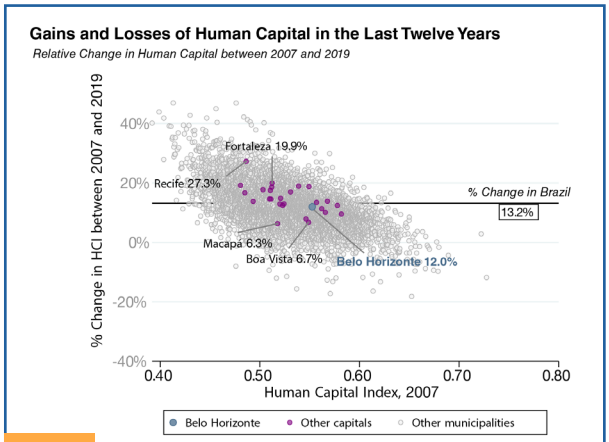

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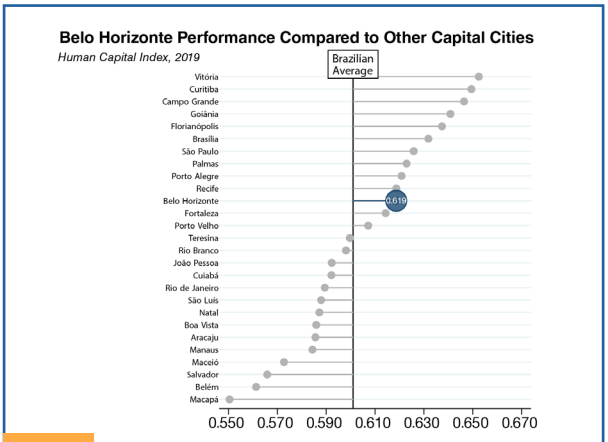


Figure 4

Average in Brazil	Belo Horizonte's rank in Brazil	Belo Horizonte's rank in Minas Gerais
0.601	1,720th	285th

Boa Vista, Roraima

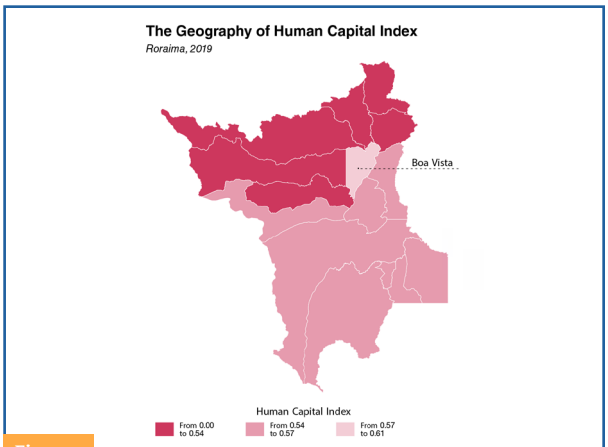
Human Capital Index: 0.586

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Boa Vista had an HCI of **0.586** in 2019. This means that the future productivity of a child born in this year is was, on average, **58.6%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Boa Vista** had insufficient performance. The municipality occupies the **21st** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. **Boa Vista's** per capita income would be **70.7%** higher if human capital were fully promoted.



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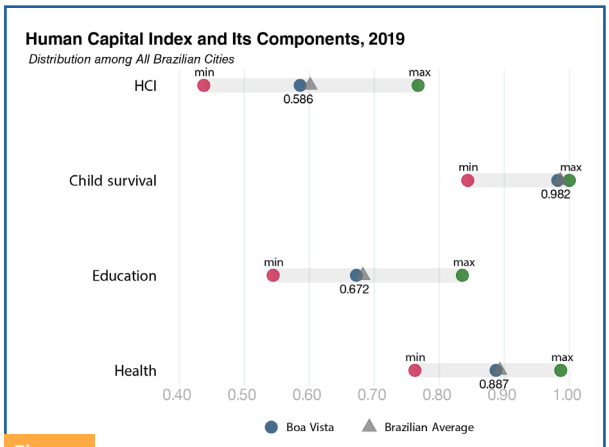

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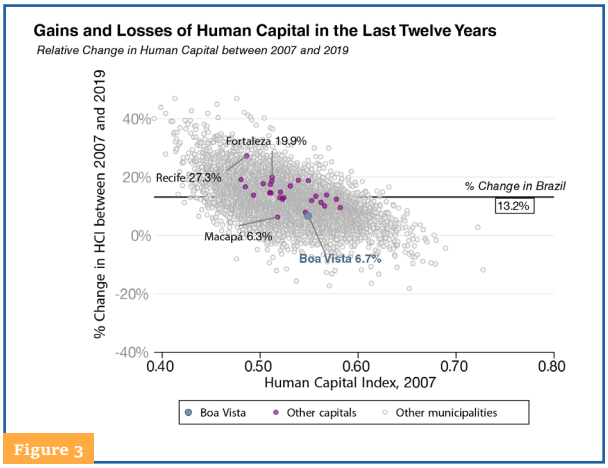

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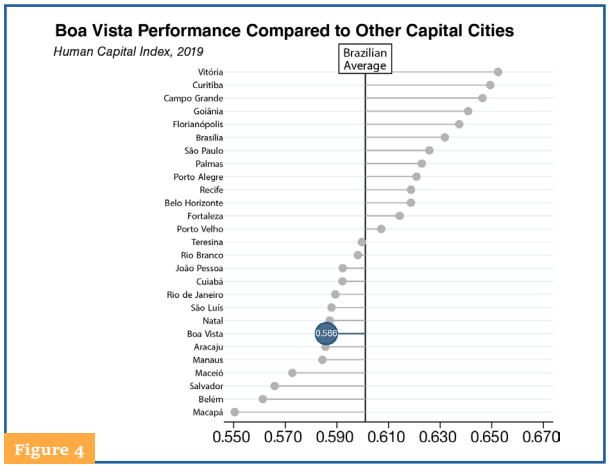
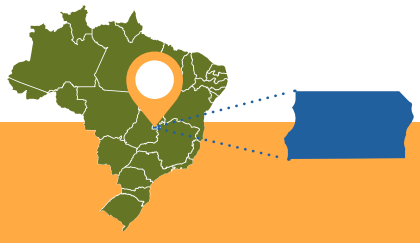


Figure 4

Average in Brazil	Boa Vista's rank in Brazil	Boa Vista's rank in Roraima
0.601	3,250th	1st

Brasília, Distrito Federal



Human Capital Index: 0.632

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Brasília had an HCI of **0.632** in 2019. This means that the future productivity of a child born in this year is was, on average, **63.2%** of its potential. This value is above the national average of 0,601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **Brasília** had satisfactory performance. The municipality occupies the **6th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Brasília's** per capita income would be **58.3%** higher if human capital were fully promoted.

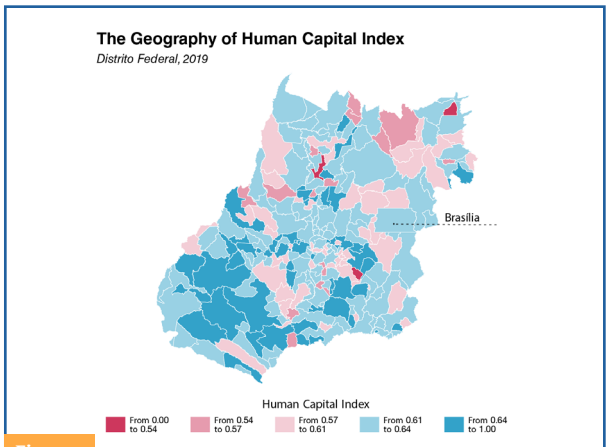
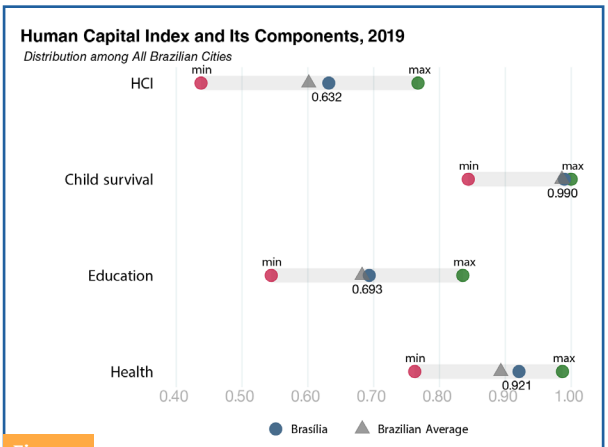


Figure 1



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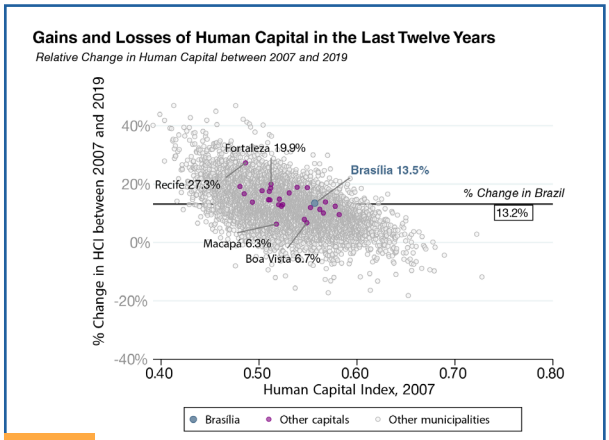

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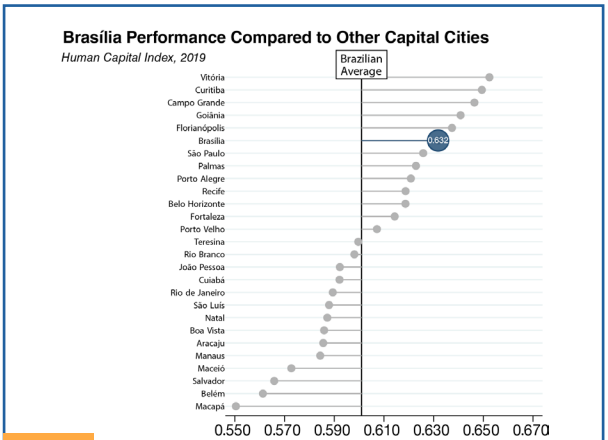
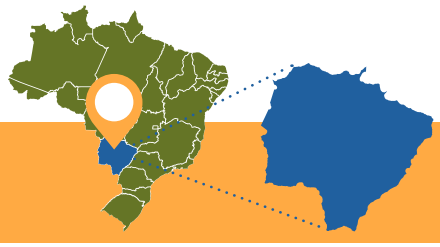


Figure 4

Average in **Brazil**
0.601

Brasília's rank **in Brazil**
1,166th

Campo Grande, Mato Grosso do Sul



Human Capital Index: 0.646

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

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Campo Grande had an HCI of **0.646** in 2019. This means that the future productivity of a child born in this year is, on average, **64.6%** of its potential. This value was above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Campo Grande** had satisfactory performance. The municipality occupies the **3rd** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Campo Grande's** per capita income would be **54.7%** higher if human capital were fully promoted.

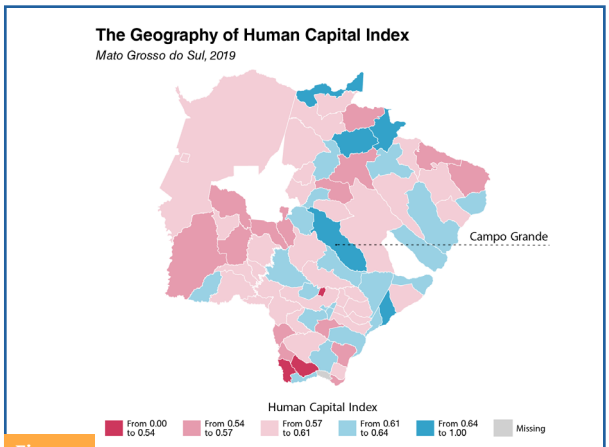
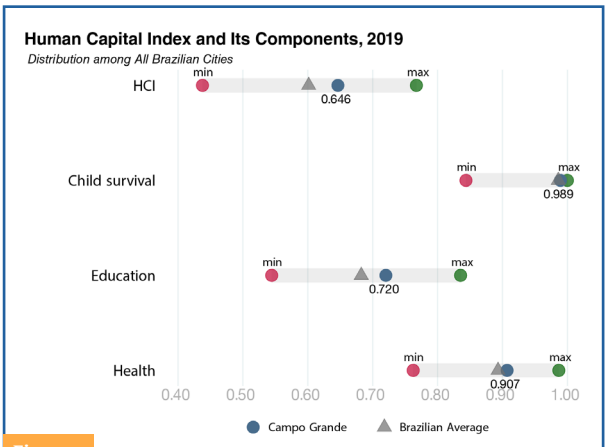


Figure 1



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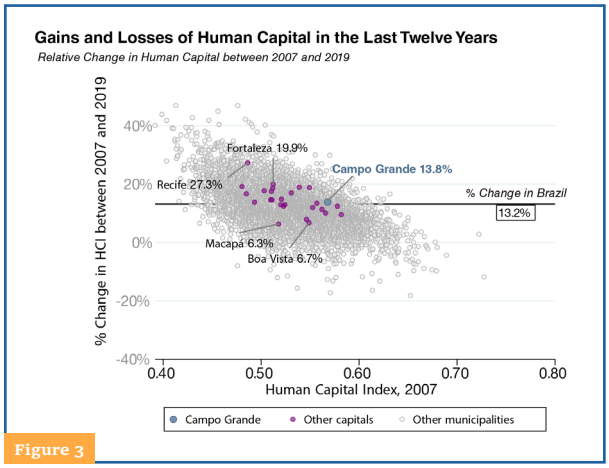

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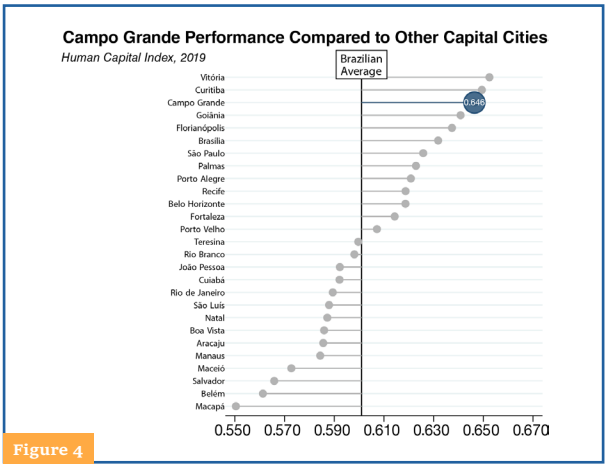
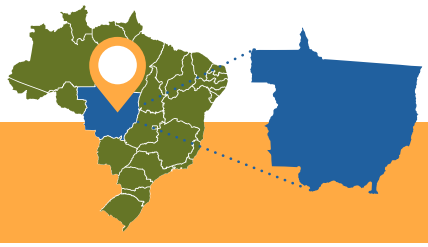


Figure 4

Average in Brazil	Campo Grande's rank in Brazil	Campo Grande's rank in Mato Grosso do Sul
0.601	625th	3rd

Cuiabá, Mato Grosso



Human Capital Index: 0.592

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Cuiabá had an HCI of **0.592** in 2019. This means that the future productivity of a child born in this year was, on average, **59.2%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Cuiabá** had insufficient performance. The municipality occupies the **17th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. **Cuiabá's** per capita income would be **68.9%** higher if human capital were fully promoted.

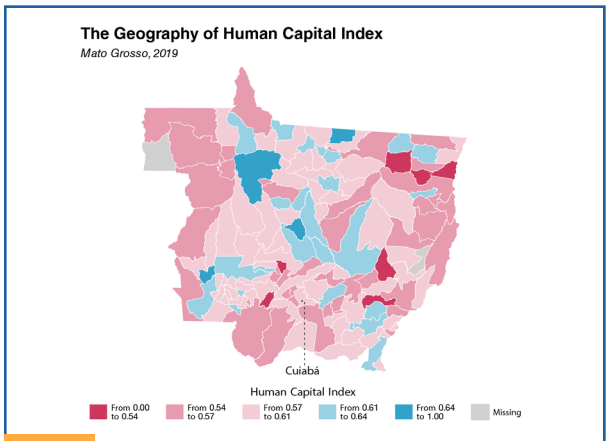
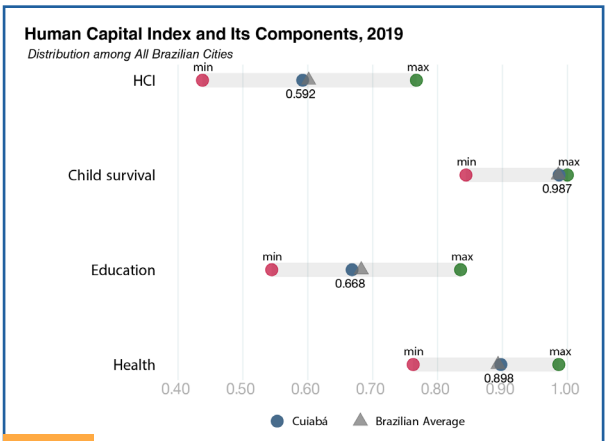


Figure 1



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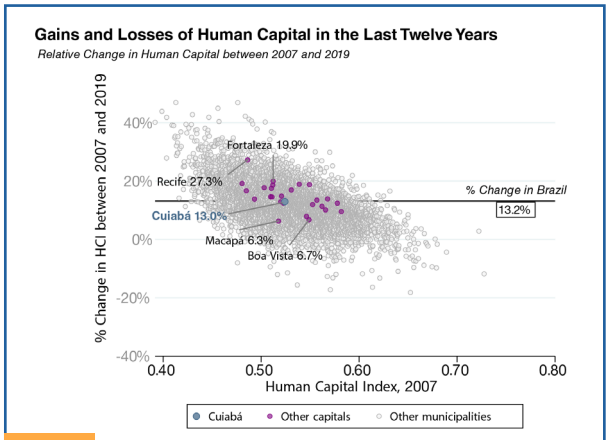

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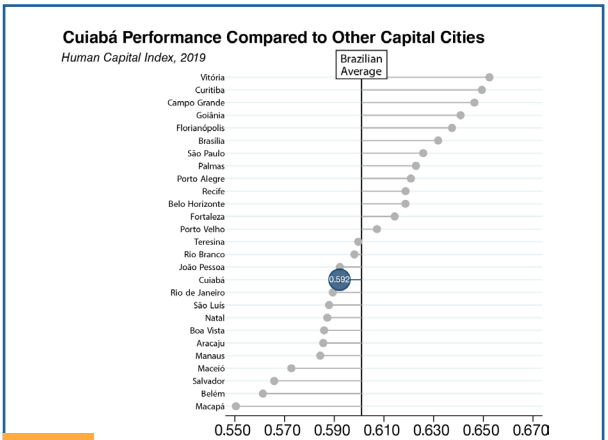


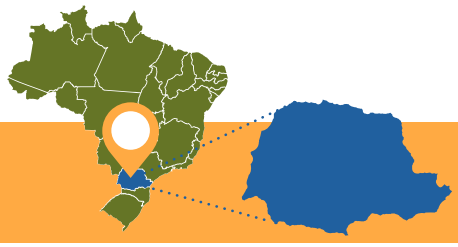
Figure 4

Average in Brazil
0.601

Cuiabá's rank in Brazil
2,984th

Cuiabá's rank in Mato Grosso
61st

Curitiba, Paraná



Human Capital Index: 0.649

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in **the Human Capital Index (HCI)** which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions for human capital accumulation.

Curitiba had an HCI of **0.649** in 2019. This means that the future productivity of a child born in this year was, on average, **64.9%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **Curitiba** had satisfactory performance. The municipality occupies the **2nd** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth below the national average in recent years *(fig. 3)*. Curitiba's per capita income would be **54.0%** higher if human capital were fully promoted.

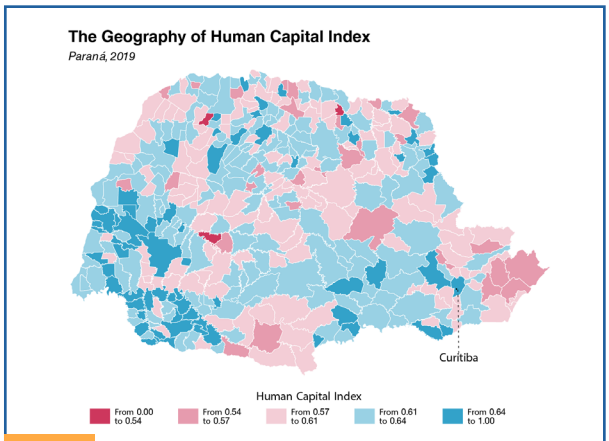
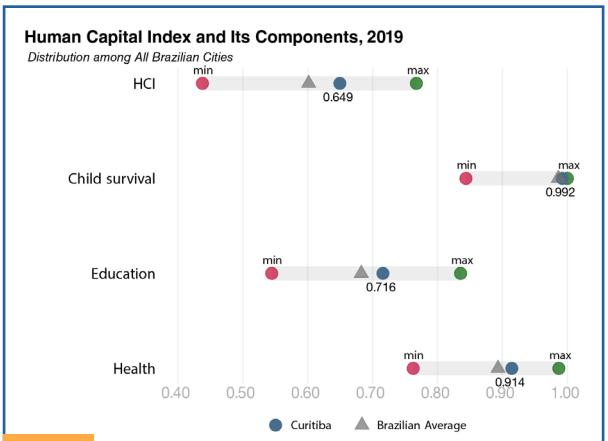


Figure 1



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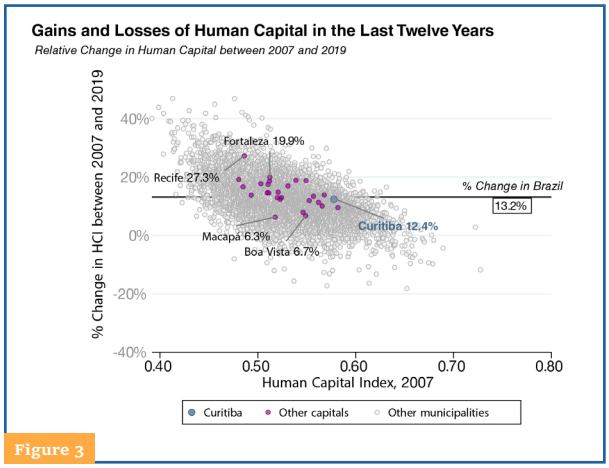


Figure 3

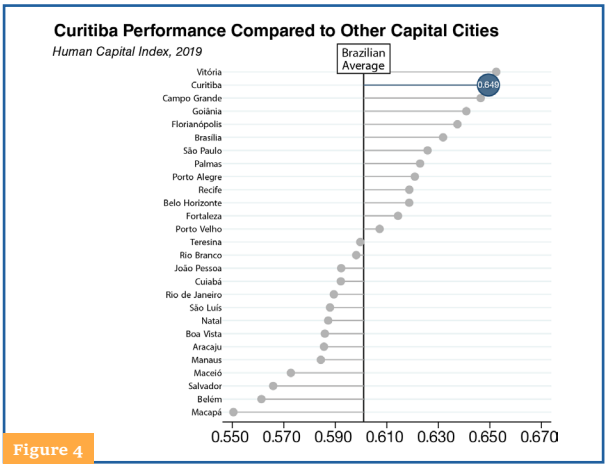
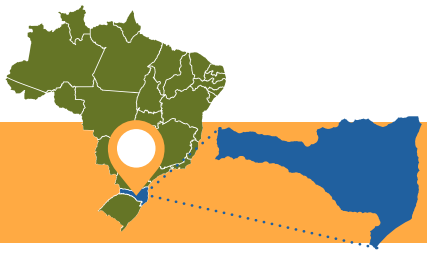


Figure 4

Average in Brazil	Curitiba's rank in Brazil	Curitiba's rank in Paraná
0.601	543rd	49th

Florianópolis, Santa Catarina



Human Capital Index: 0.637

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Florianópolis had an HCI of 0.637 in 2019. This means that the future productivity of a child born in this year was, on average, **63.7%** of its potential.

This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **Florianópolis** had satisfactory performance. The municipality occupies the **5th** among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth below the national average in recent years *(fig. 3)*. **Florianópolis**' per capita income would be **56.9%** higher if human capital were fully promoted.

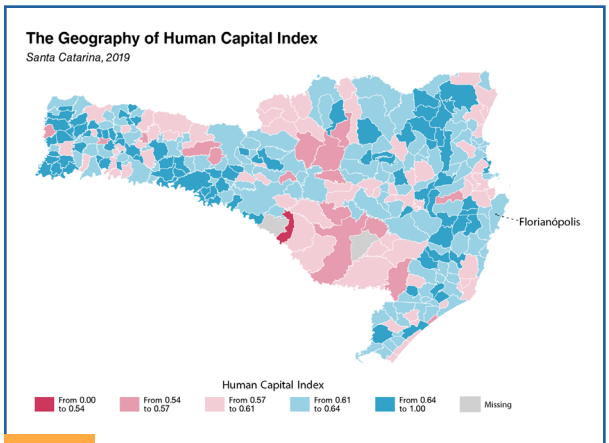


Figure 1

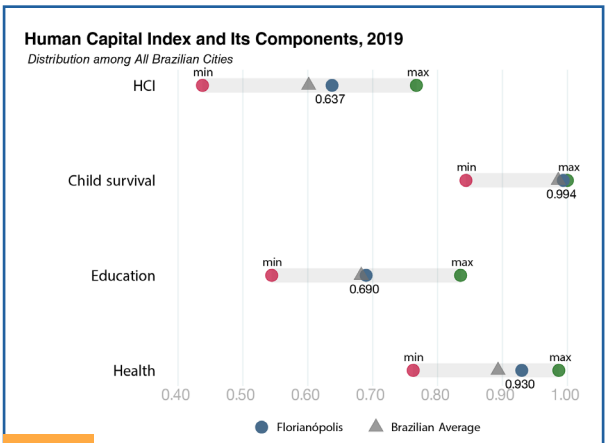


Figure 2

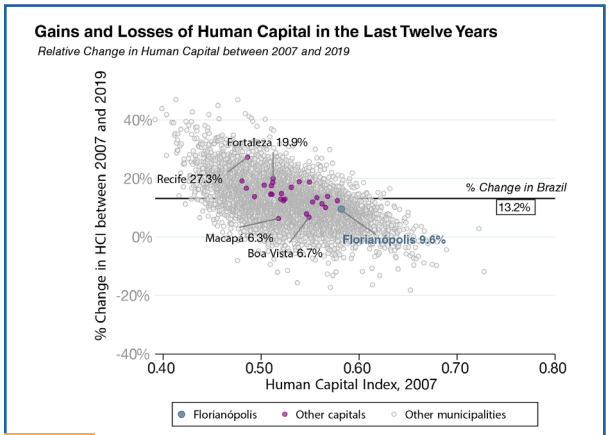


Figure 3

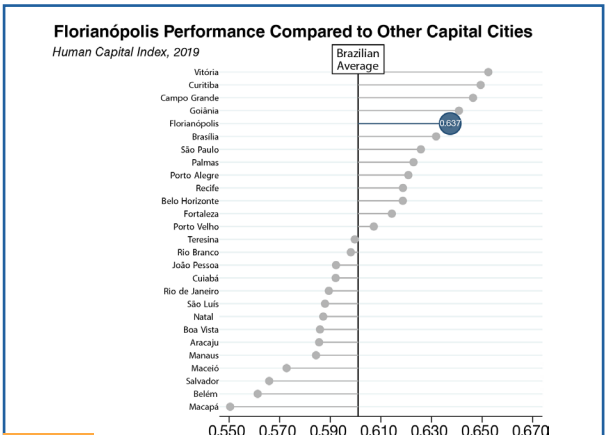


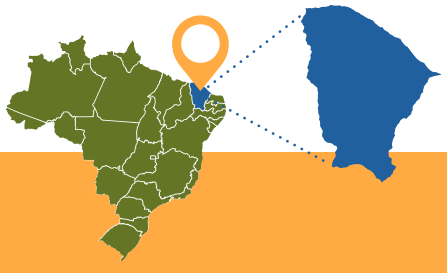
Figure 4

Average in Brazil
0.601

Florianópolis' rank in Brazil
942nd

Florianópolis' rank in Santa Catarina
109th

Fortaleza, Ceará



Human Capital Index: 0.614

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Fortaleza had an HCI of **0.614** in 2019. This means that the future productivity of a child born in this year was, on average, **61.4%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Fortaleza** had satisfactory performance. The municipality occupies the **12th** position among the 27state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Fortaleza's** per capita income would be **62.8%** higher if human capital were fully promoted.

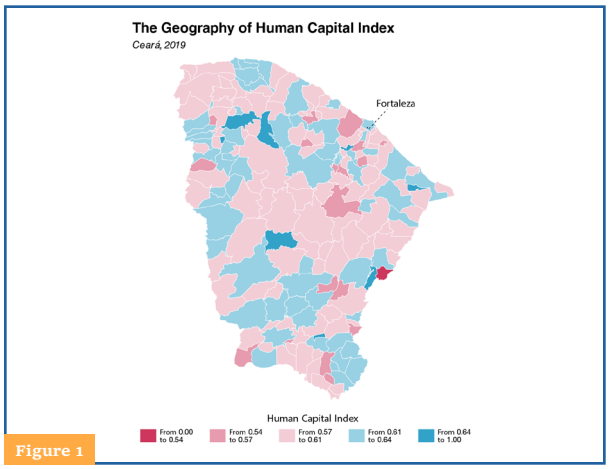


Figure 1

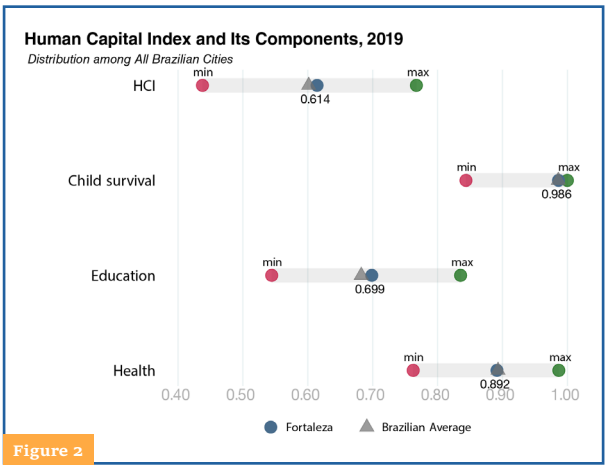


Figure 2

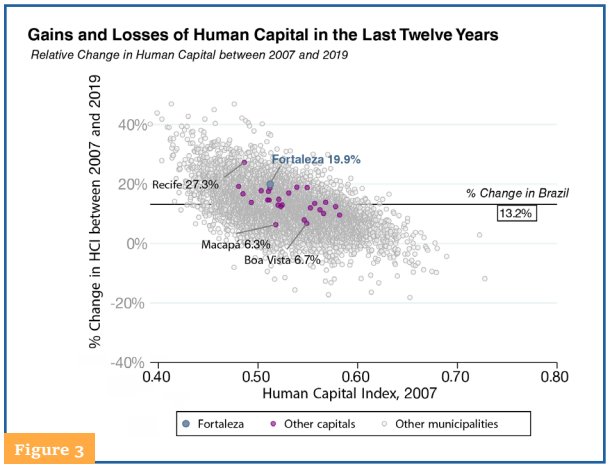


Figure 3

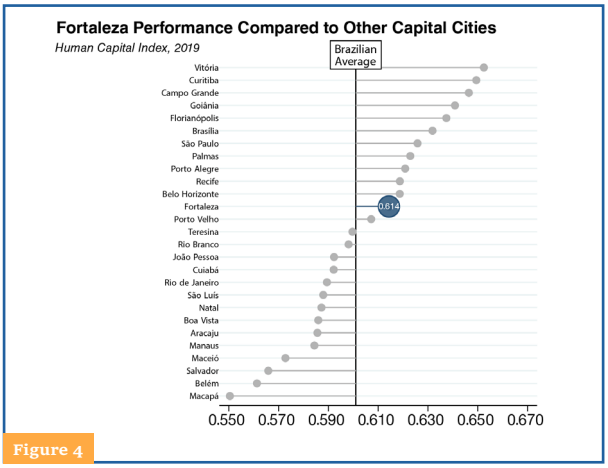


Figure 4

Average in Brazil	Fortaleza's rank in Brazil	Fortaleza's rank in Ceará
0.601	1,915th	45th

Goiânia, Goiás

Human Capital Index: 0.641

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions for human capital accumulation.

Goiânia had an HCI of **0.641** in 2019. This means that the future productivity of a child born in this year was, on average, **64.1%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Goiânia** had satisfactory performance. The municipality occupies the **4th** among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Goiânia's** per capita income would be **56.0%** higher if human capital were fully promoted.

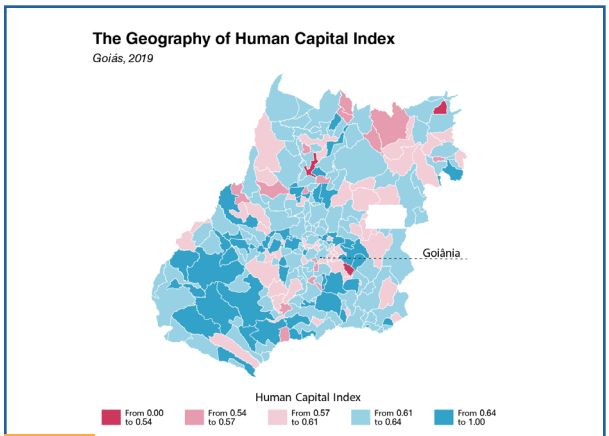


Figure 1

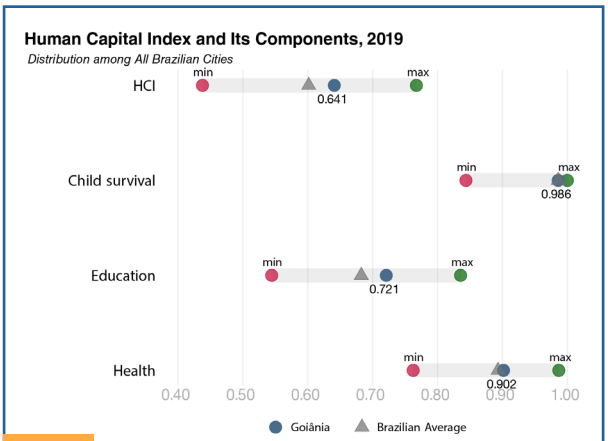


Figure 2

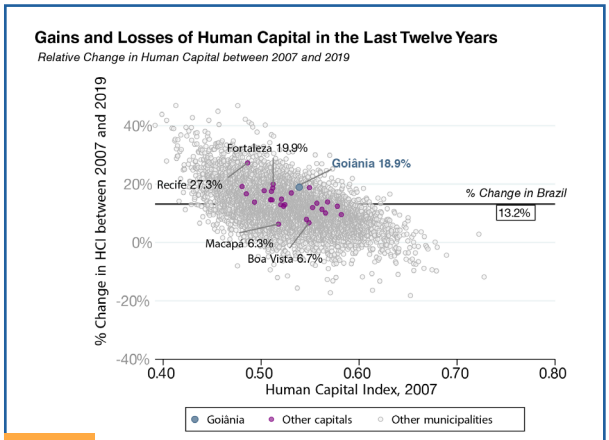


Figure 3

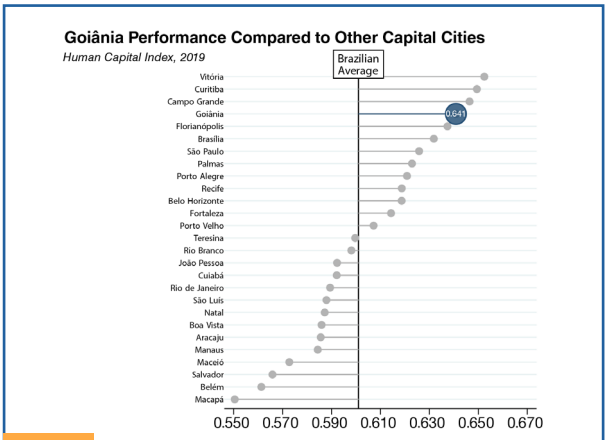
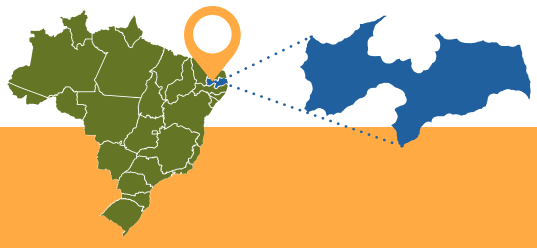


Figure 4

Average in Brazil	Goiânia's rank in Brazil	Goiânia's rank in Goiás
0.601	821st	60th

João Pessoa, Paraíba



Human Capital Index: 0.592

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

João Pessoa had an HCI of **0.592** in 2019. This means that the future productivity of a child born in this year was, on average, **59.2%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **João Pessoa** had insufficient performance. The municipality occupies the **16th** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **João Pessoa's** per capita income would be **68.8%** higher if human capital were fully promoted.

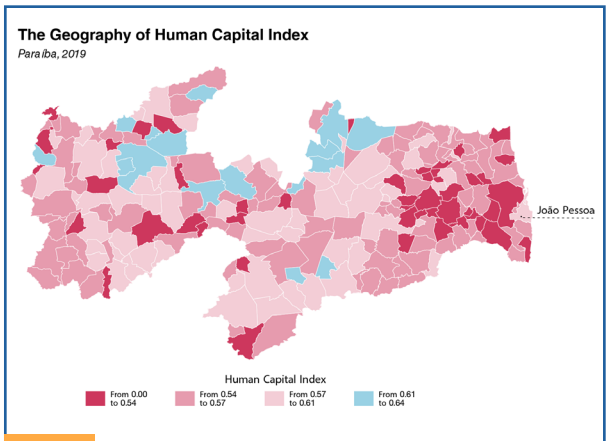


Figure 1

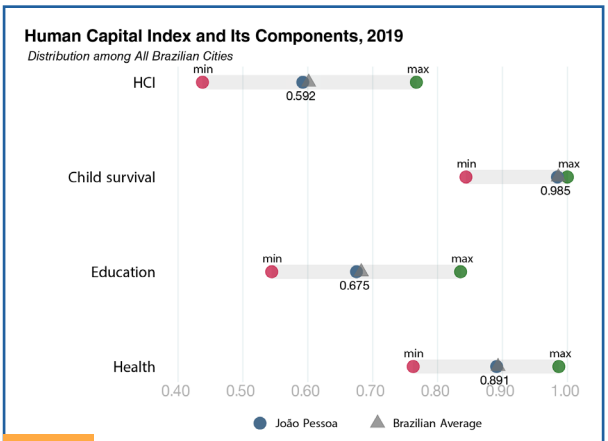


Figure 2

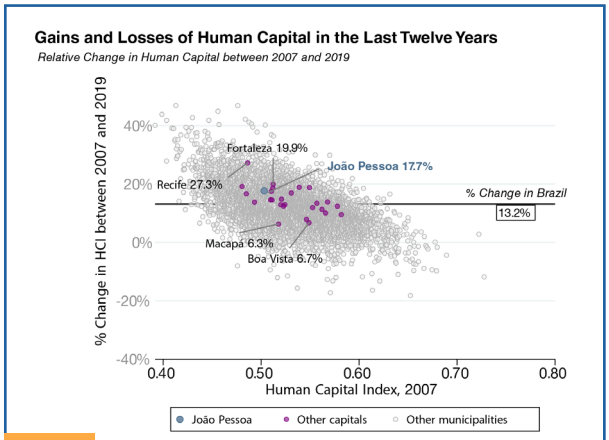


Figure 3

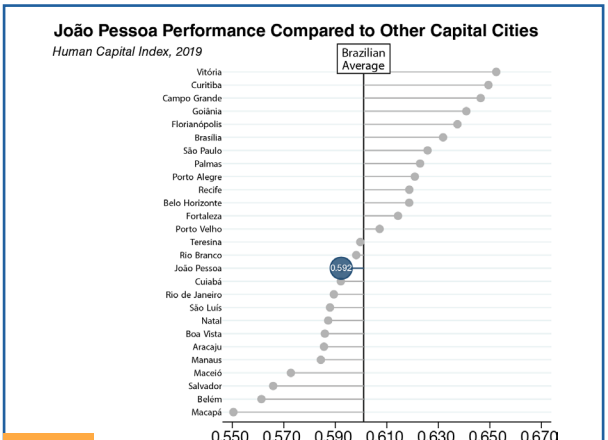


Figure 4

Average in Brazil	João Pessoa's rank in Brazil	João Pessoa's rank in Paraíba
0.601	2,979th	44th

Macapá, Amapá

Human Capital Index: 0.550

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Macapá had an HCI of **0.550** in 2019. This means that the future productivity of a child born in this year was, on average, **55.0%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Macapá** had insufficient performance. The municipality occupies the **27th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. Macapá's per capita income would be **81.7%** higher if human capital were fully promoted.

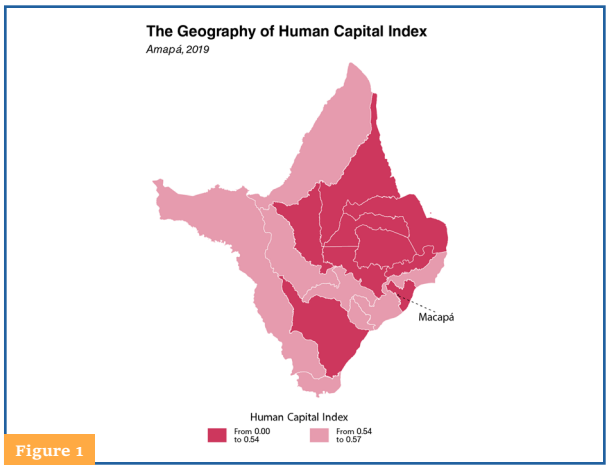


Figure 1

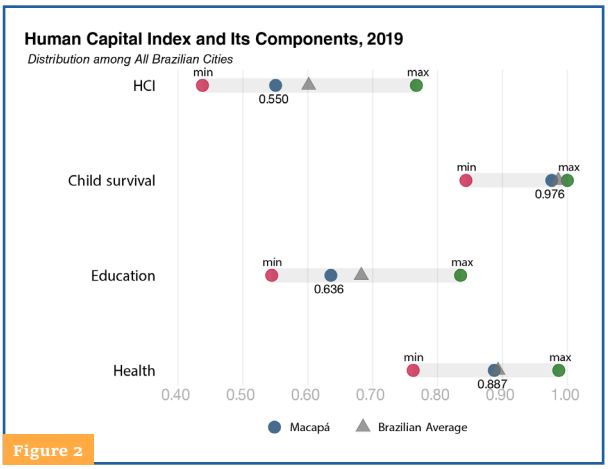


Figure 2

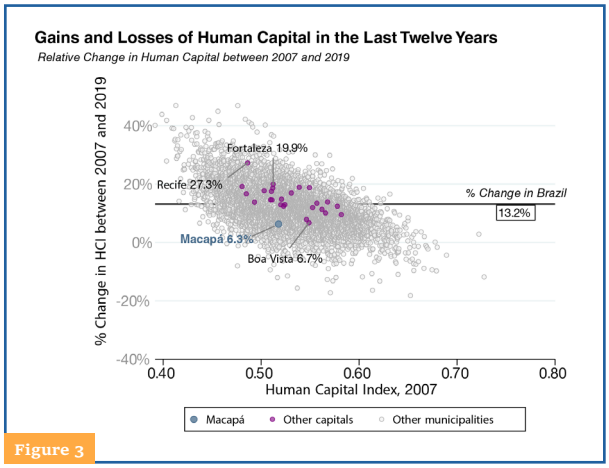


Figure 3

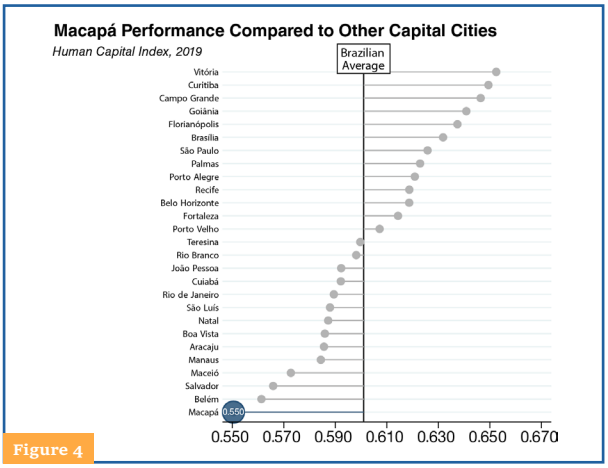
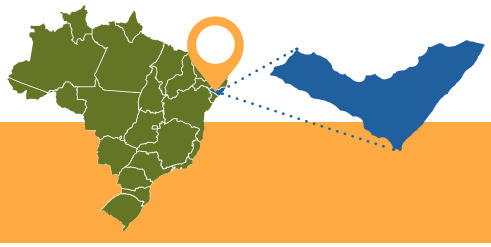


Figure 4

Average in Brazil	Macapá's rank in Brazil	Macapá's rank in Amapá
0.601	4,549th	4th

Maceió, Alagoas



Human Capital Index: 0.573

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) of the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Maceió had an HCI of **0.573** in 2019. This means that the future productivity of a child born in this year was, on average, 57.3% of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Maceió** had insufficient performance. The municipality occupies the **24th** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Maceió's** per capita income would be **74.6%** higher if human capital were fully promoted.

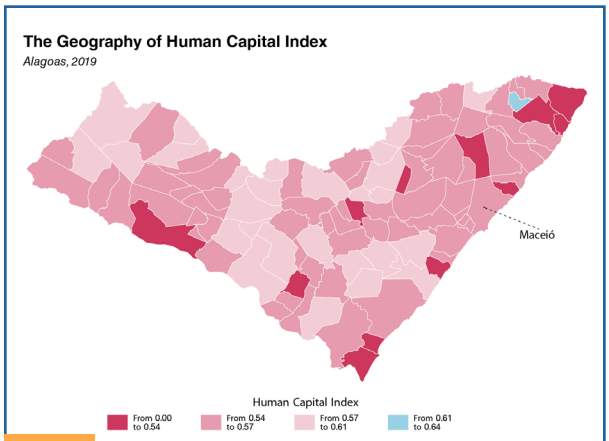


Figure 1

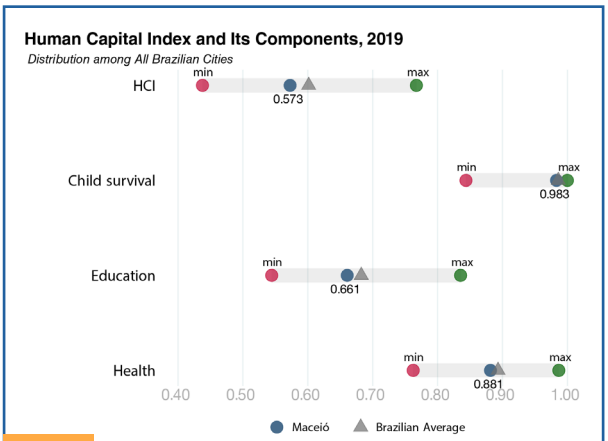


Figure 2

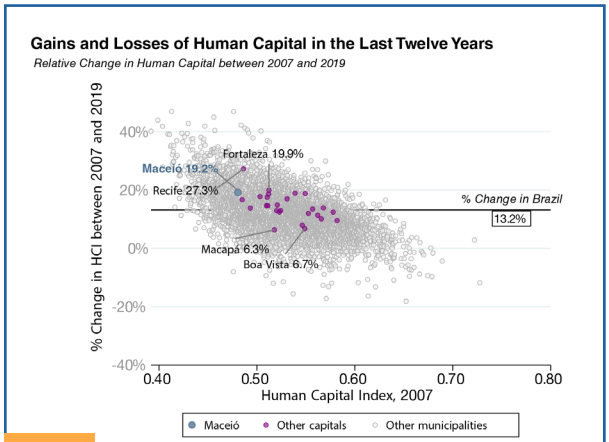


Figure 3

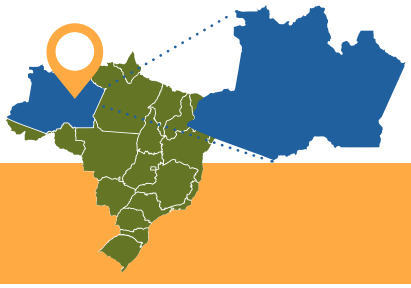
Figure 4

Average in Brazil
0.601

Maceió's rank in Brazil
3,764th

Maceió's rank in Alagoas
31st

Manaus, Amazonas



Human Capital Index: 0.584

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Manaus had an HCI of **0.584** in 2019. This means that the future productivity of a child born in this year was, on average, **58.4%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by health performance.

In relation to other state capitals, **Manaus** had insufficient performance. The municipality occupies the **23rd** position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Manaus'** per capita income would be **71.1%** higher if human capital were fully promoted.

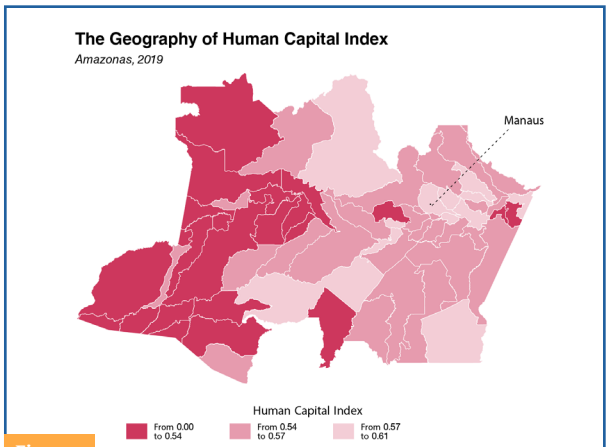
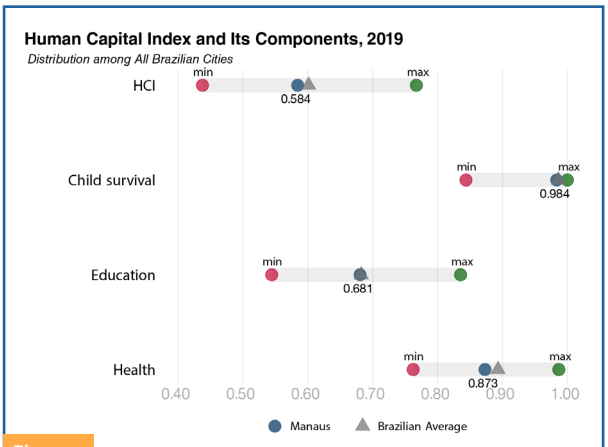


Figure 1



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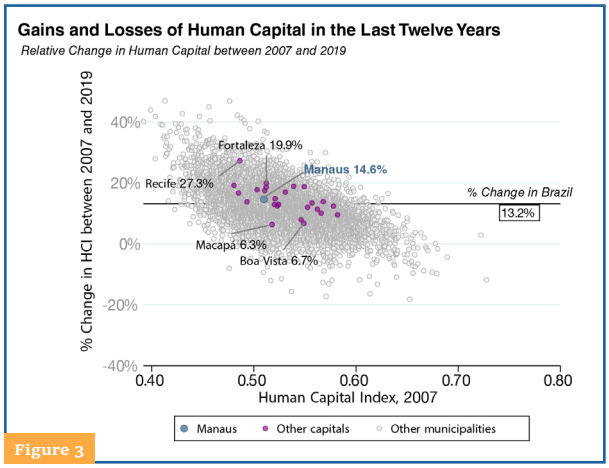


Figure 3

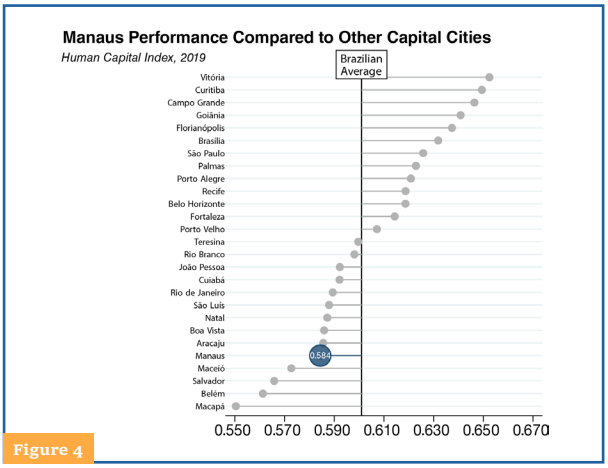
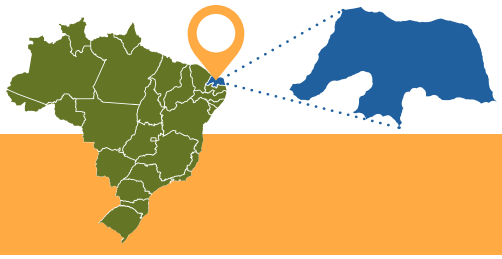


Figure 4

Average in Brazil	Manaus' rank in Brazil	Manaus' rank in Amazonas
0.601	3,314th	9th

Natal, Rio Grande do Norte



Human Capital Index: 0.587

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Natal had an HCI of **0.587** in 2019. This means that the future productivity of a child born in this year was, on average, **58.7%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Natal** had insufficient performance. The municipality occupies the **20th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. **Natal's** per capita income would be **70.3%** higher if human capital were fully promoted.

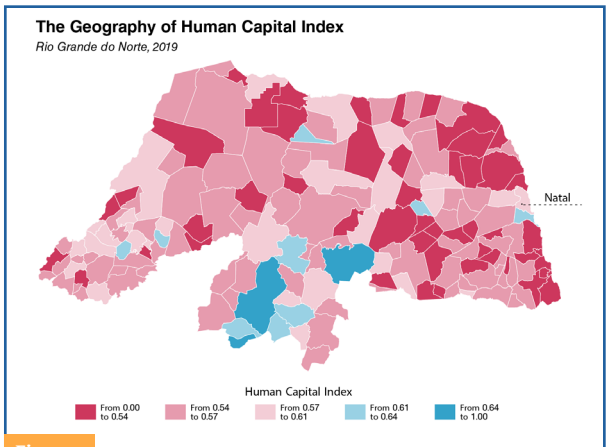


Figure 1

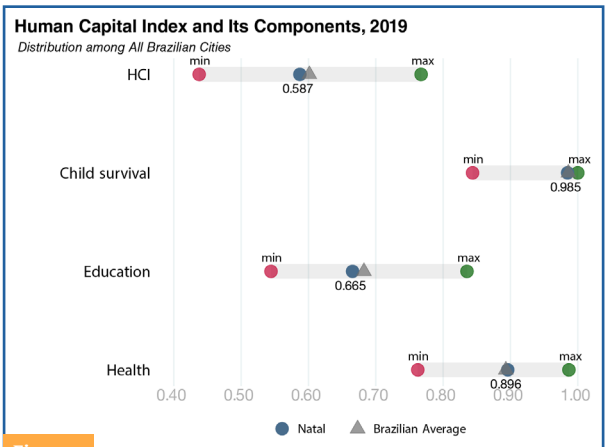


Figure 2

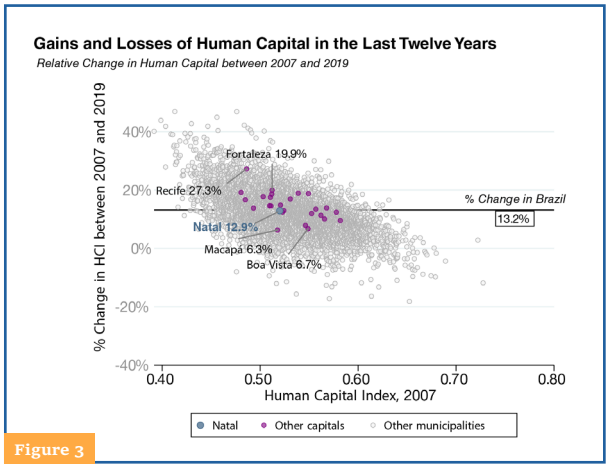


Figure 3

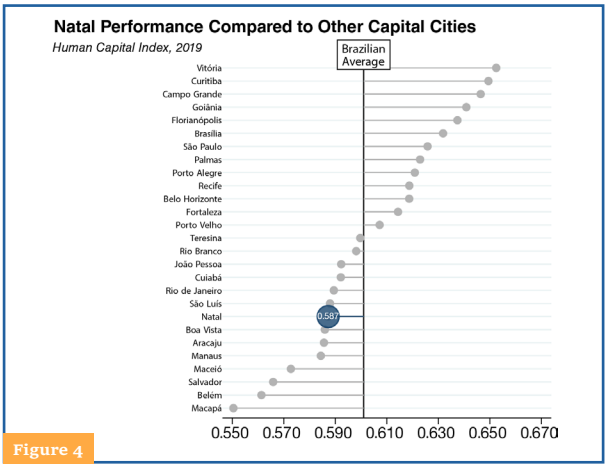


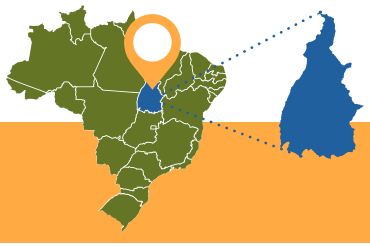
Figure 4

Average in Brazil
0.601

Natal's rank in Brazil
3,199th

Natal's rank in Rio Grande do Norte
26th

Palmas, Tocantins



Human Capital Index: 0.623

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Palmas had an HCI of **0.623** in 2019. This means that the future productivity of a child born in this year was, on average, **62.3%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Palmas** had satisfactory performance. The municipality occupies the 8th position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth below the national average in recent years *(fig. 3)*. **Palmas'** per capita income would be **60.5%** higher if human capital were fully promoted.

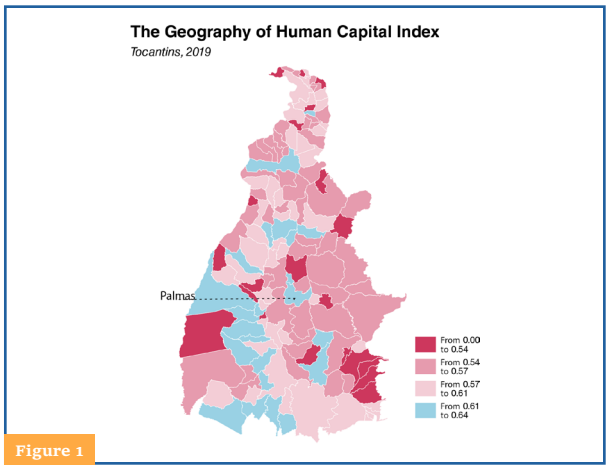


Figure 1

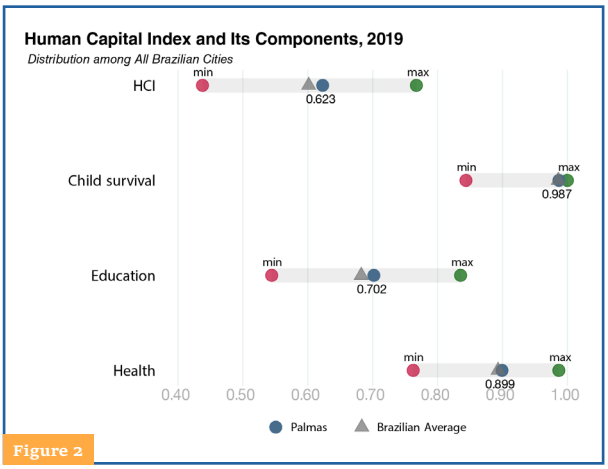


Figure 2

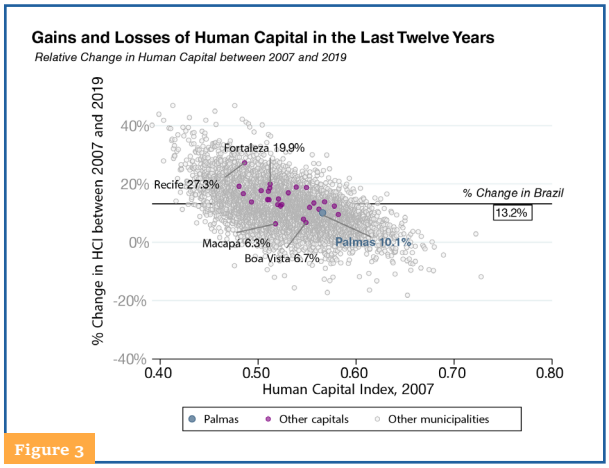


Figure 3

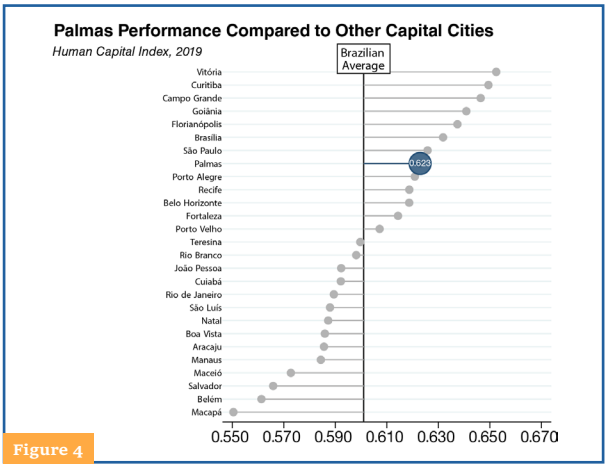
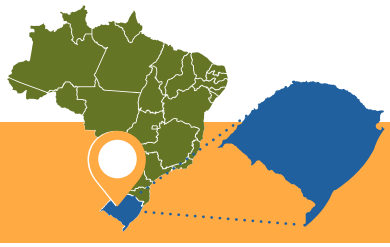


Figure 4

Average in Brazil	Palmas' rank in Brazil	Palmas' rank in Tocantins
0.601	1,531st	10th

Porto Alegre, Rio Grande do Sul



Human Capital Index: 0.621

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Porto Alegre had an HCI of **0.621** in 2019. This means that the future productivity of a child born in this year was, on average, **62.1%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and heath performance.

In relation to other state capitals, **Porto Alegre** had satisfactory performance. The municipality occupies the **9th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Porto Alegre's** per capita income would be **61.1%** higher if human capital were fully promoted.

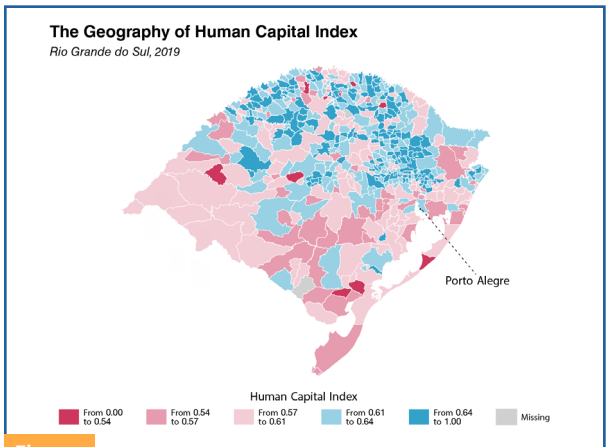


Figure 1

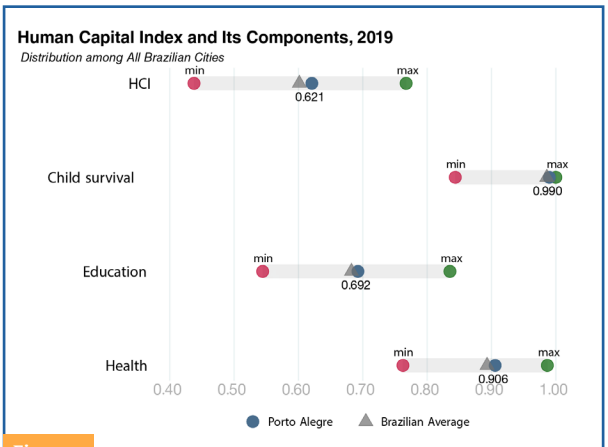


Figure 2

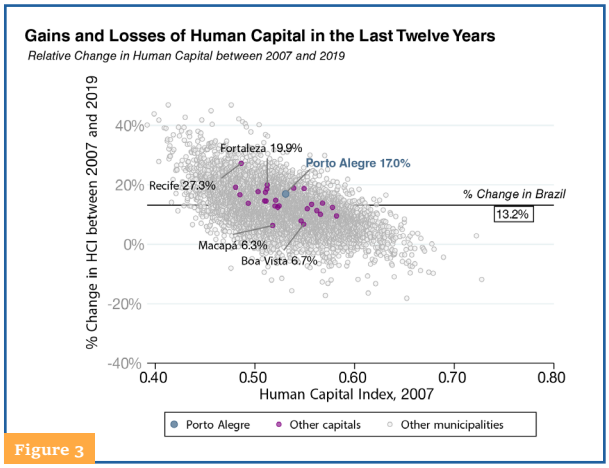


Figure 3

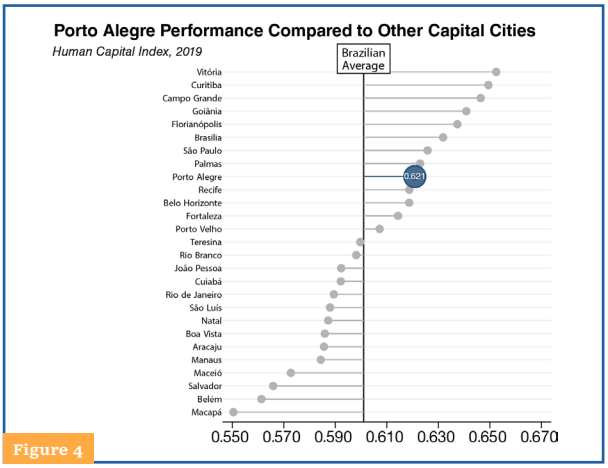
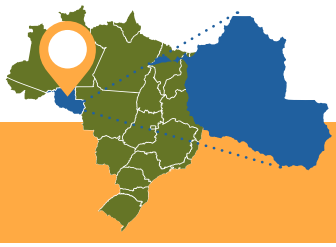


Figure 4

Average in Brazil	Porto Alegre's rank in Brazil	Porto Alegre's rank in Rio Grande do Sul
0.601	1,620th	266th

Porto Velho, Rondônia



Human Capital Index: 0.607

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Porto Velho had an HCI of **0.607** in 2019. This means that the future productivity of a child born in this year was, on average, **60.7%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Porto Velho** had satisfactory performance. The municipality occupies the **13th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years *(fig. 3)*. **Porto Velho's** per capita income would be **64.7%** higher if human capital were fully promoted.

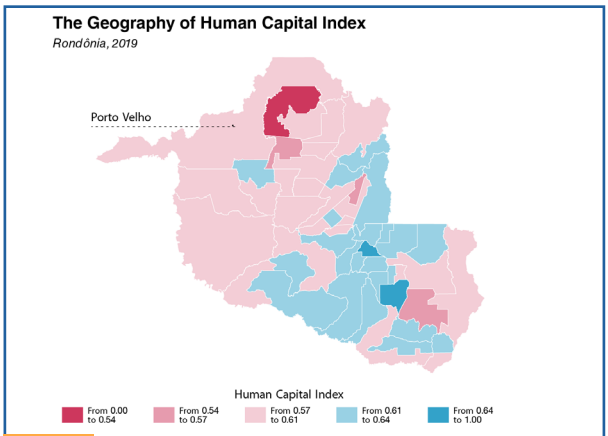


Figure 1

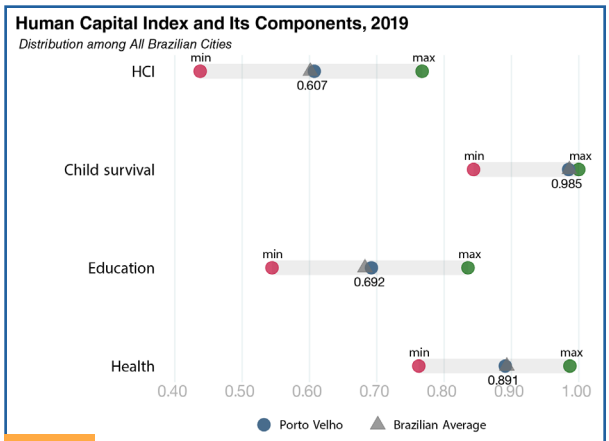


Figure 2

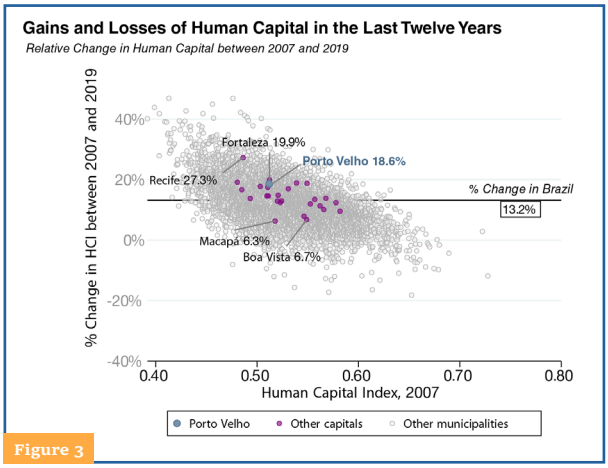


Figure 3

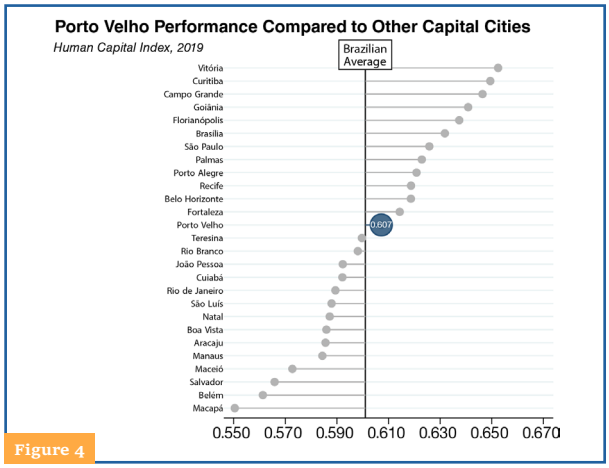
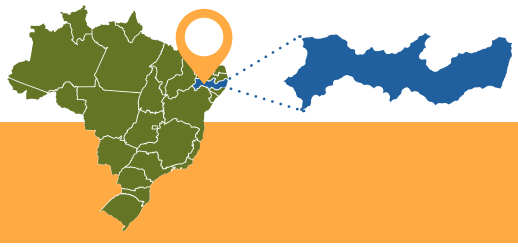


Figure 4

Average in Brazil	Porto Velho's rank in Brazil	Porto Velho's rank in Rondônia
0.601	2,273rd	27th

Recife, Pernambuco



Human Capital Index: 0.619

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Recife had an HCI of **0.619** in 2019. This means that the future productivity of a child born in this year was, on average, **61.9%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Recife** had satisfactory performance. The municipality occupies the **10th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth above the national average in recent years **Recife's** per capita income would be **61.6%** higher if human capital were fully promoted.

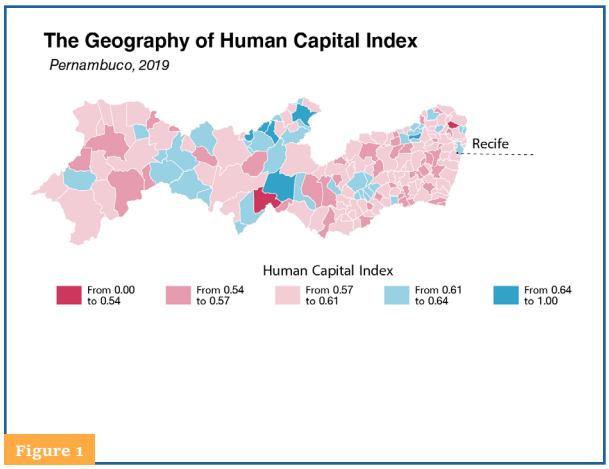


Figure 1

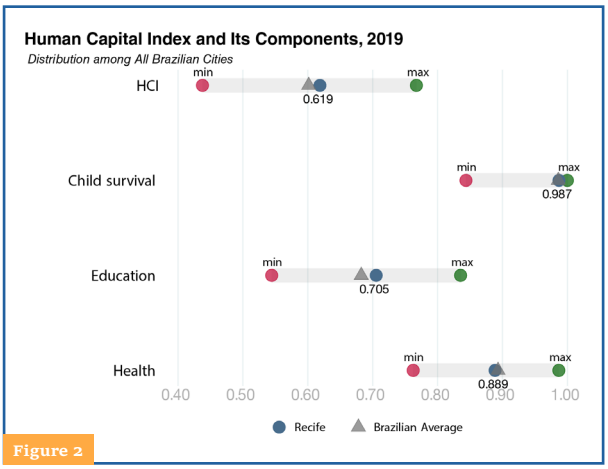


Figure 2

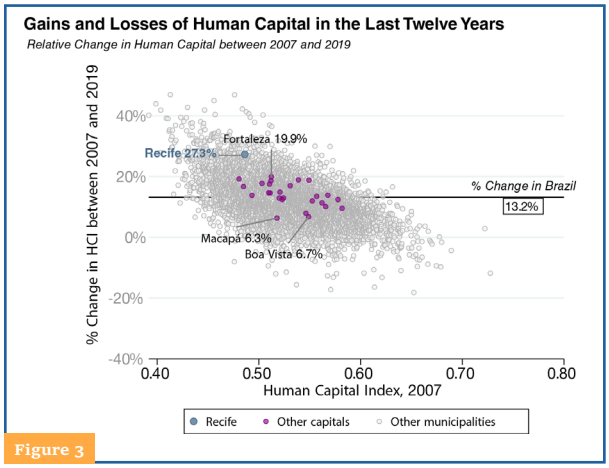


Figure 3

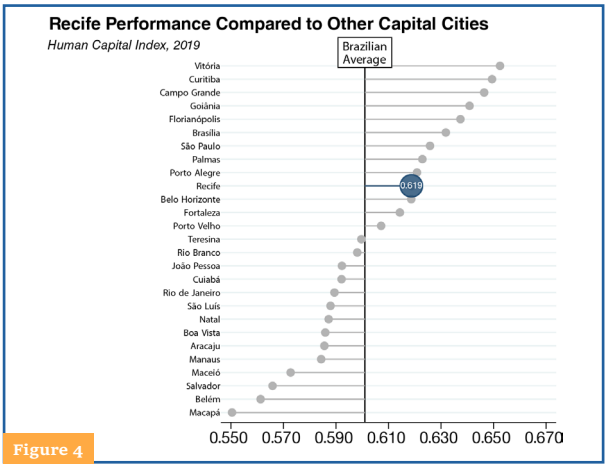
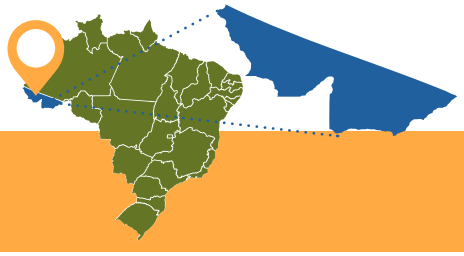


Figure 4

Average in Brazil	Recife's rank in Brazil	Recife's rank in Pernambuco
0.601	1,715rd	21st

Rio Branco, Acre



Human Capital Index: 0.598

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

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Rio Branco had an HCI of **0.598** in 2019. This means that the future productivity of a child born in this year was, on average, **59.8%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by health performance.

In relation to other state capitals, **Rio Branco** had insufficient performance. The municipality occupies the 15th position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Rio Branco's** per capita income would be **67.2%** higher if human capital were fully promoted.

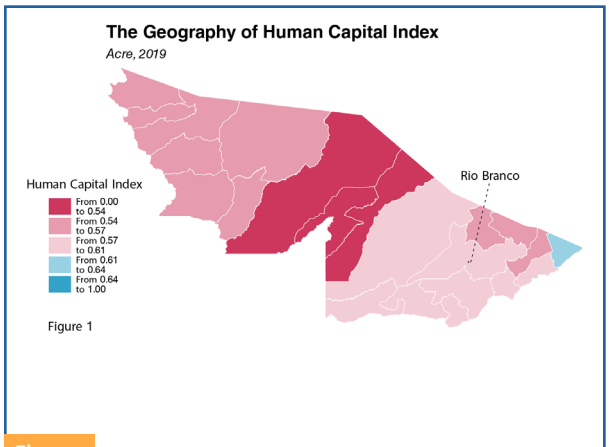


Figure 1

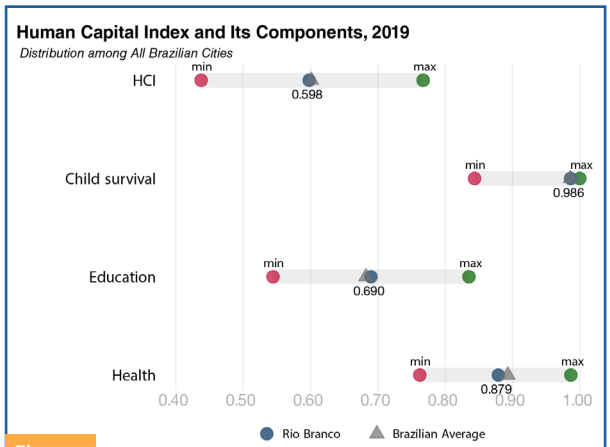


Figure 2

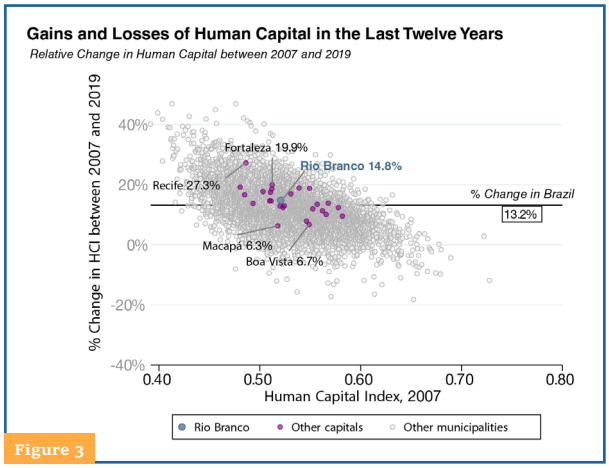


Figure 3

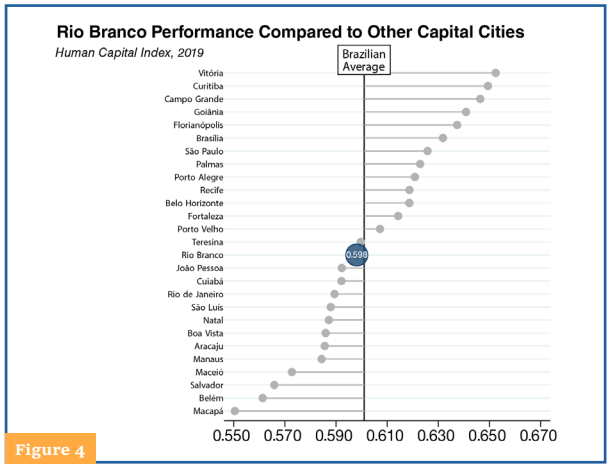
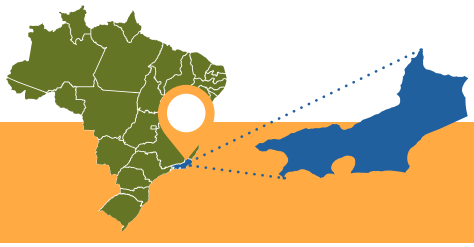


Figure 4

Average in Brazil	Rio Branco's rank in Brazil	Rio Branco's rank in Acre
0.601	2,700th	4th

Rio de Janeiro, Rio de Janeiro



Human Capital Index: 0.589

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

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Rio de Janeiro had an HCI of **0.589** in 2019. This means that the future productivity of a child born in this year was, on average, **58.9%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Rio de Janeiro** had insufficient performance. The municipality occupies the **18th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. **Rio de Janeiro's** per capita income would be **69.7%** higher if human capital were fully promoted.

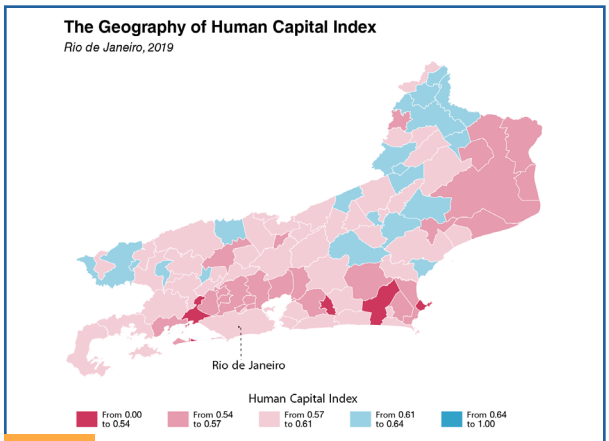


Figure 1

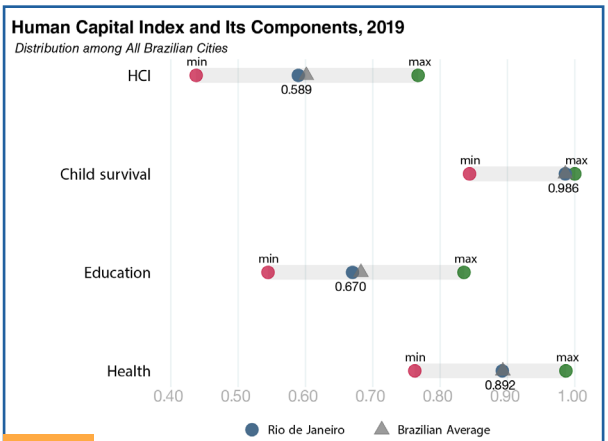


Figure 2

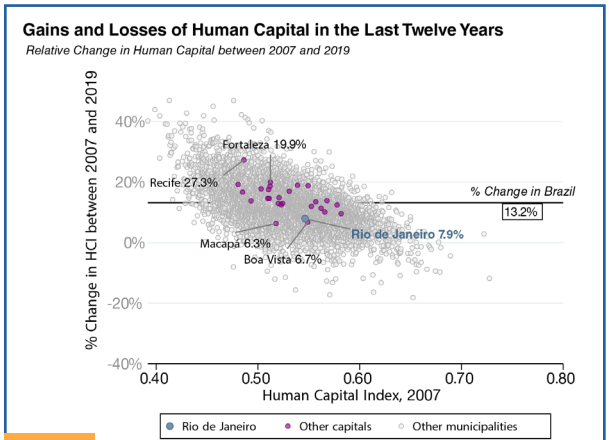


Figure 3

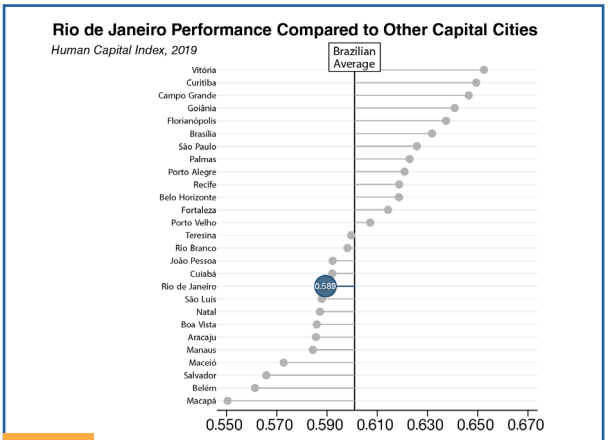
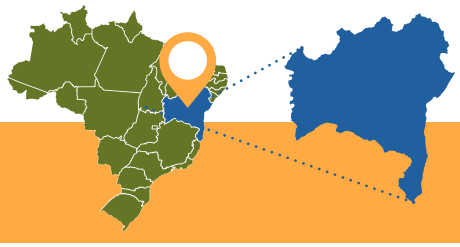


Figure 4

Average in Brazil	Rio de Janeiro's rank in Brazil	Rio de Janeiro's rank in Rio de Janeiro
0.601	3,102nd	49th

Salvador, Bahia



Human Capital Index: 0.566

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

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Salvador had an HCI of **0.566** in 2019. This means that the future productivity of a child born in this year was, on average, **56.6%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

In relation to other state capitals, **Salvador** had insufficient performance. The municipality occupies the 25th position among other state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Salvador's** per capita income would be **76.7%** higher if human capital were fully promoted.

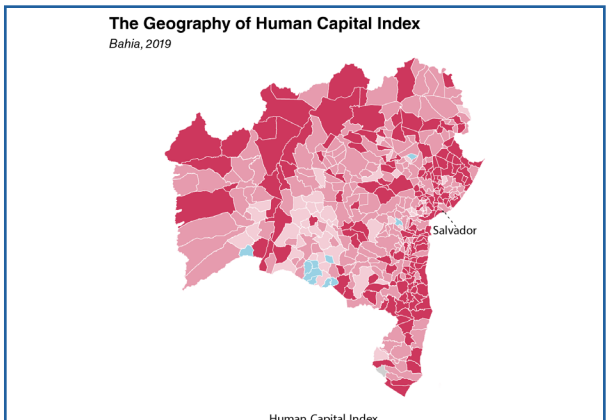
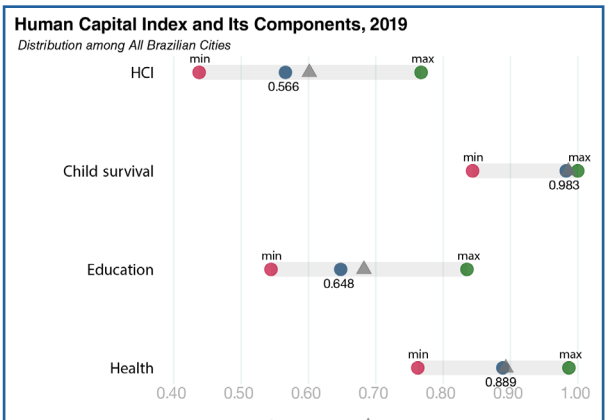


Figure 1



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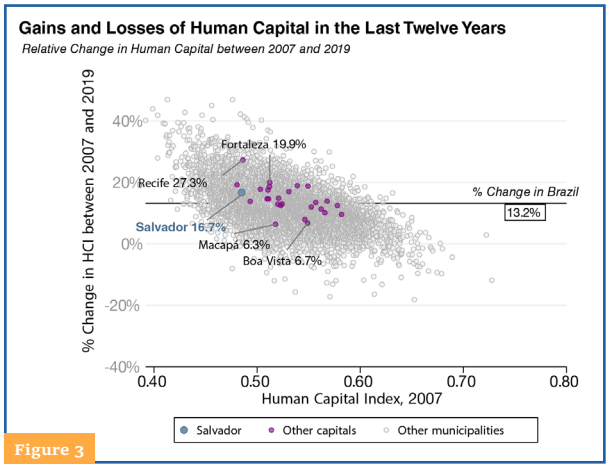


Figure 3

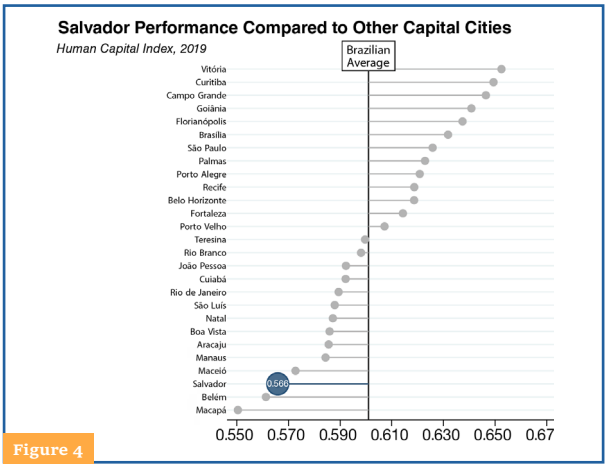


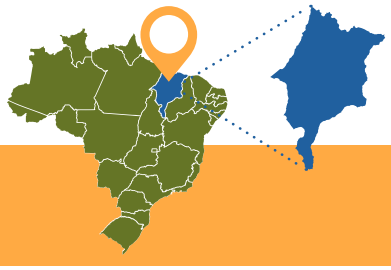
Figure 4

Average in Brazil
0.601

Salvador's rank in Brazil
3,998th

Salvador's rank in Bahia
87th

São Luís, Maranhão



Human Capital Index: 0.588

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

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São Luís had an HCI of **0.588** in 2019. This means that the future productivity of a child born in this year was, on average, **58.8%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **São Luís** had insufficient performance. The municipality occupies the **19th** position among the 27 state capitals in Brazil *(fig. 4)*, and has had a growth below the national average in recent years *(fig. 3)*. **São Luís'** per capita income would be **70.1%** higher if human capital were fully promoted.

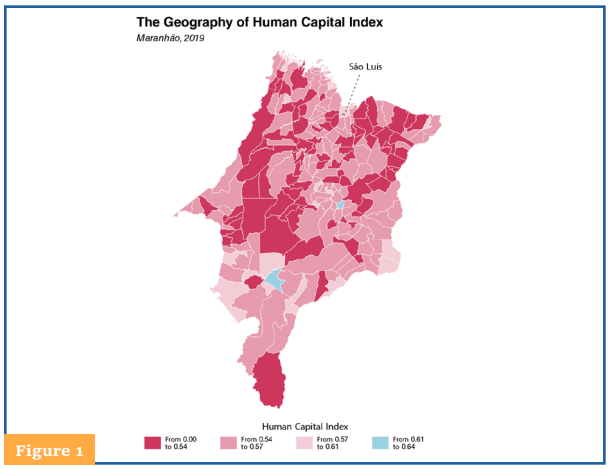


Figure 1

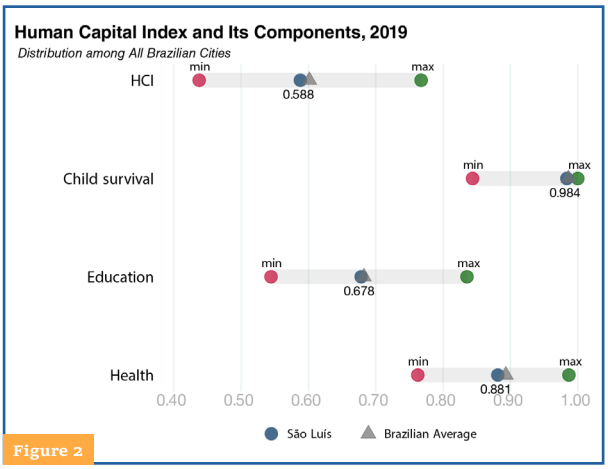


Figure 2

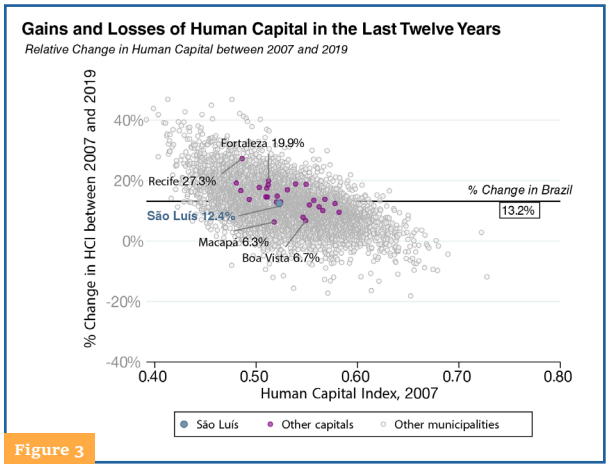


Figure 3

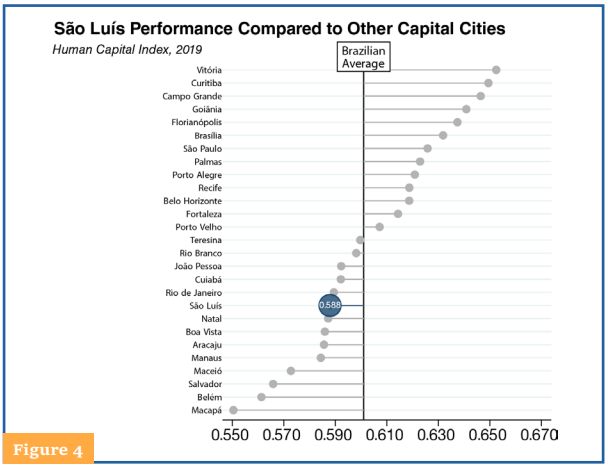
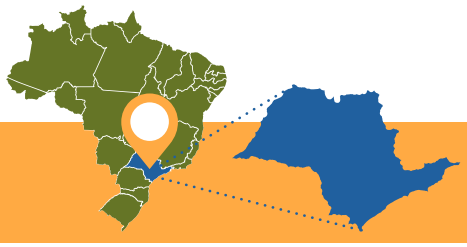


Figure 4

Average in Brazil	São Luís' rank in Brazil	São Luís' rank in Maranhão
0.601	3,174th	9th

São Paulo, São Paulo



Human Capital Index: 0.626

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

São Paulo had an HCI of **0.626** in 2019. This means that the future productivity of a child born in this year was, on average, **62.6%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **São Paulo** had satisfactory performance. The municipality occupies the 7th position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth below the national average in recent years *(fig. 3)*. **São Paulo's** per capita income would be **59.8%** higher if human capital were fully promoted.

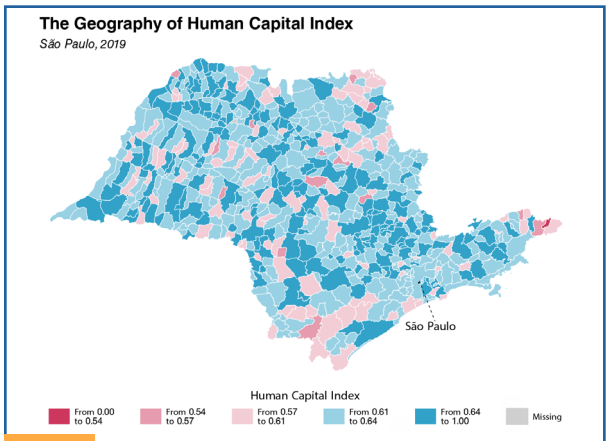
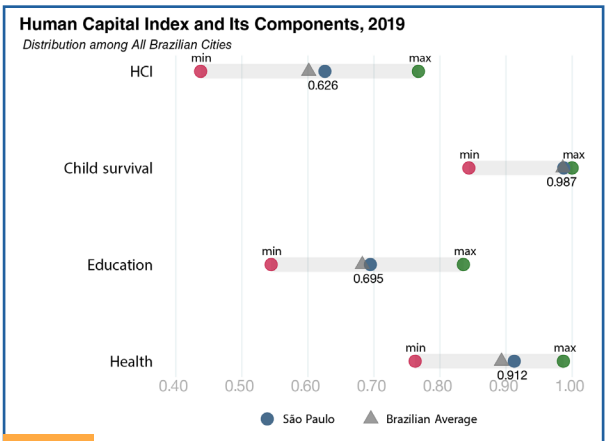


Figure 1



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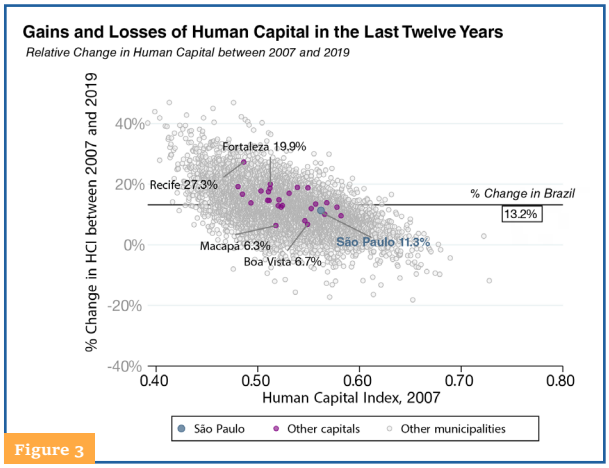

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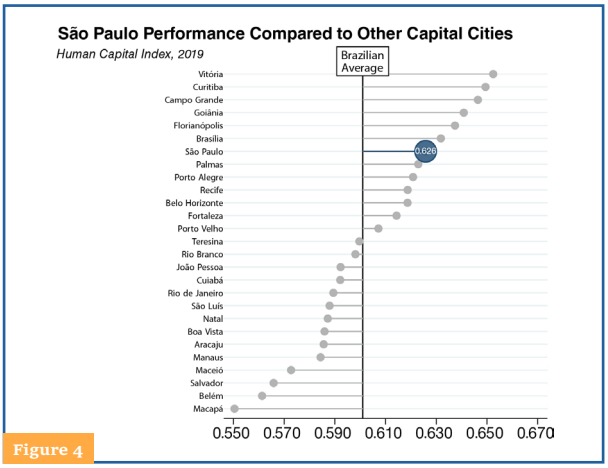
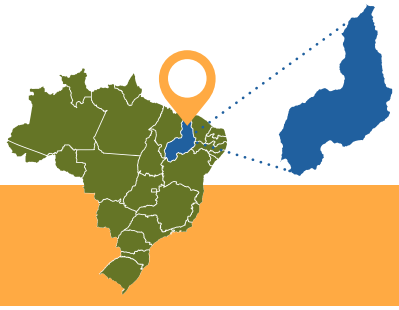


Figure 4

Average in Brazil	São Paulo's rank in Brazil	São Paulo's rank in São Paulo
0.601	1,411th	390th

Teresina, Piauí



Human Capital Index: 0.600

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate, and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Teresina had an HCI of **0.600** in 2019. This means that the future productivity of a child born in this year was, on average, **60.0%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by health performance.

In relation to other state capitals, **Teresina** had insufficient performance. The municipality occupies the 14th position among the 27 state capitals in Brazil *(fig. 4)*, despite HCI growth above the national average in recent years *(fig. 3)*. **Teresina's** per capita income would be **66.8%** higher if human capital were fully promoted.

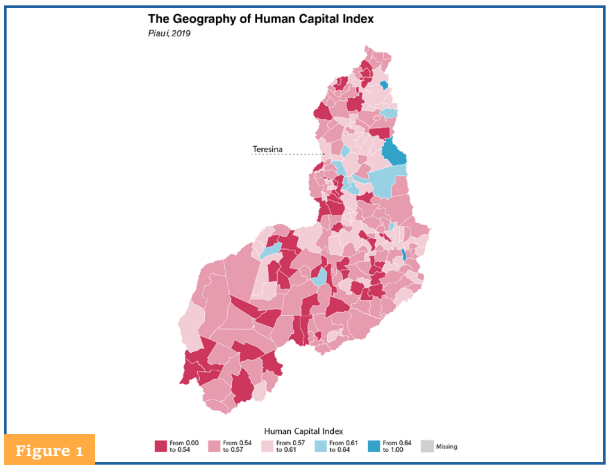
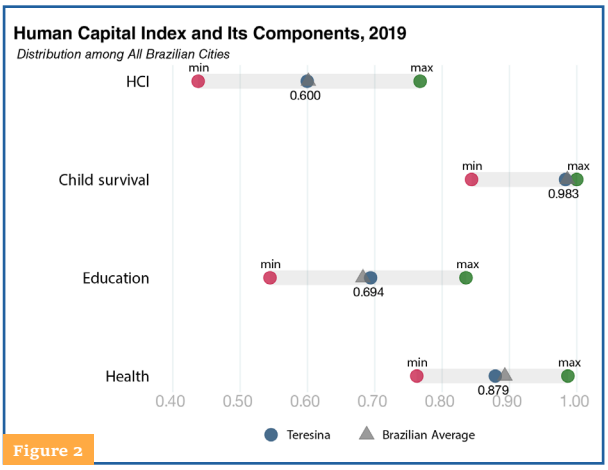


Figure 1



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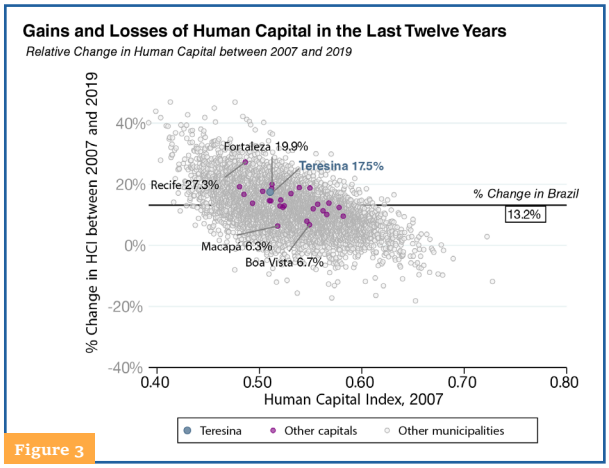


Figure 3

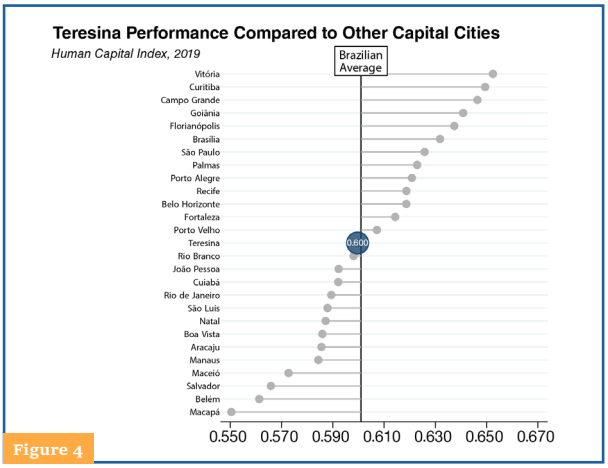
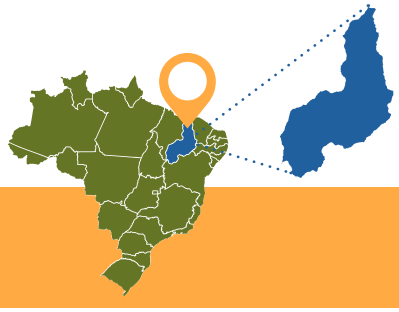


Figure 4

Average in Brazil	Teresina's rank in Brazil	Teresina's rank in Piauí
0.601	2,615th	27th

Cocal dos Alves, Piauí



Human Capital Index: 0.740

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

The municipality of Cocal dos Alves shows a strong performance in the Human Capital Index, in comparison to the **state average**. As such, it was chosen to participate in this research.

Cocal dos Alves stands out for having one of the highest HCIs in Brazil. The municipality had an HCI of **0.740** in 2019. This means that the future productivity of a child born this year is, on average, **74%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

Compared to the other cities in the state, **Cocal dos Alves** occupies the **1st** position in Piauí's ranking *(fig. 4)*. Moreover, in recent years the municipality's HCI has significantly increased *(fig. 3)*: from 2007 to 2019, there was an increase of 29.9% in its HCI. The municipality's per capita income would be **35.1%** higher if human capital were fully promoted.

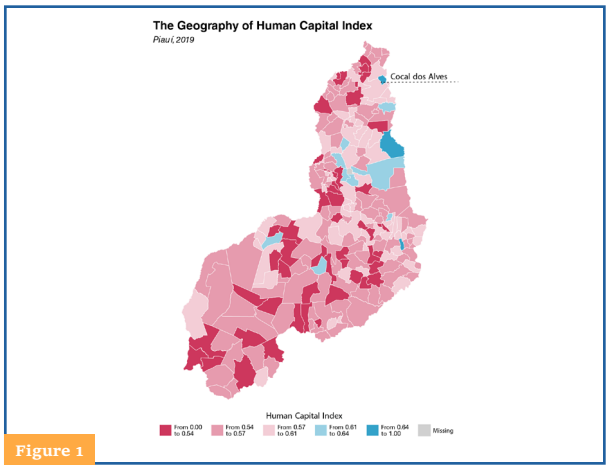
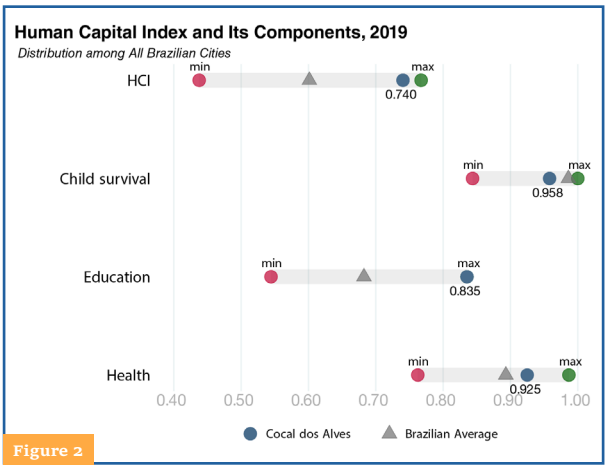


Figure 1



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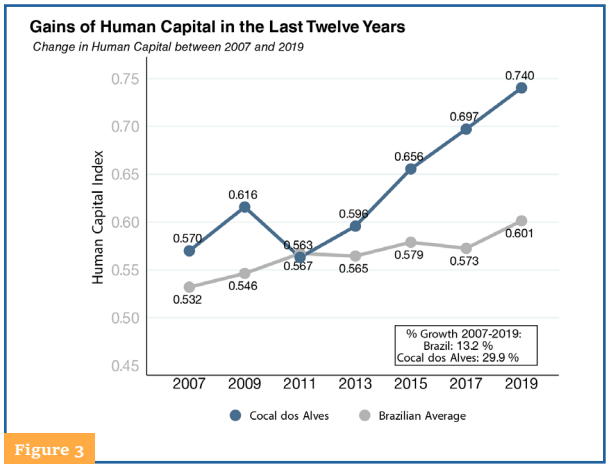

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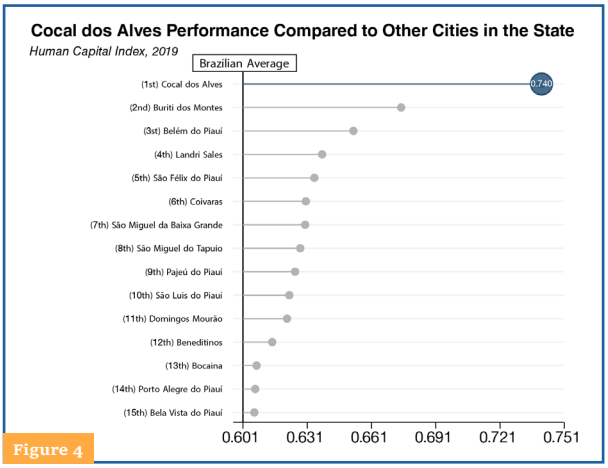
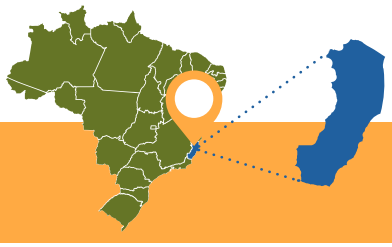


Figure 4

Average in Brazil	Cocal dos Alves' rank in Brazil	Cocal dos Alves' rank in Piauí
0.601	3rd	1st

Vitória, Espírito Santo



Human Capital Index: 0.652

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals. The message of this project is that the success of a society lies in its ability to promote, allocate and strengthen human talent.

This effort is materialized in the **Human Capital Index (HCI)** which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

Vitória had an HCI of **0.652** in 2019. This means that the future productivity of a child born in this year was, on average, **65.2%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational and health performance.

In relation to other state capitals, **Vitória** had satisfactory performance. The municipality occupies the **1st** position in the rank of capitals in Brazil *(fig. 4)* and has had a growth above the national average in recent years *(fig. 3)*. **Vitória's** per capita income would be **53.3%** higher if human capital were fully promoted.

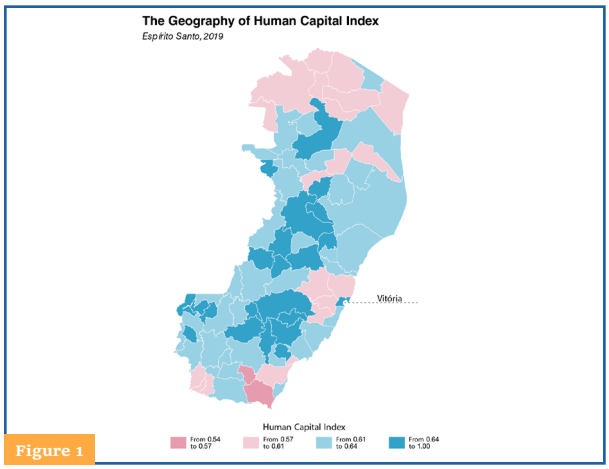
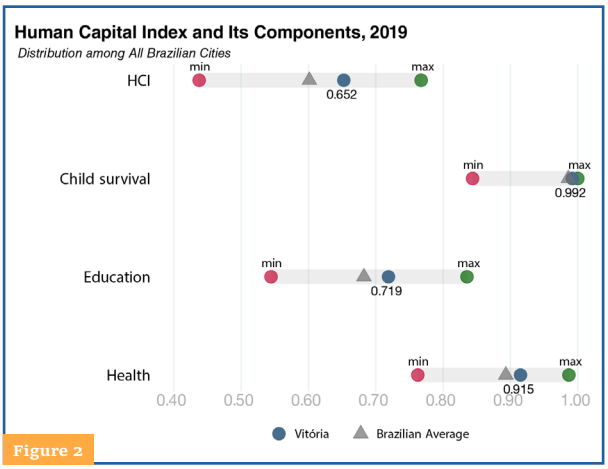


Figure 1



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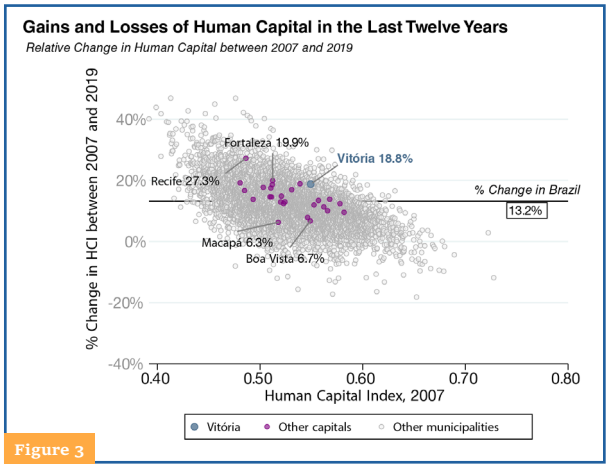

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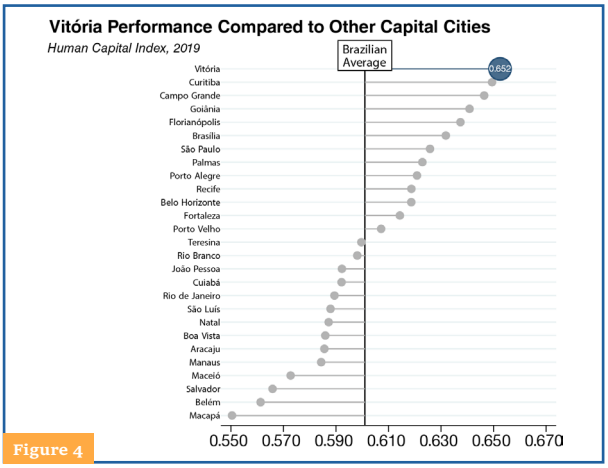


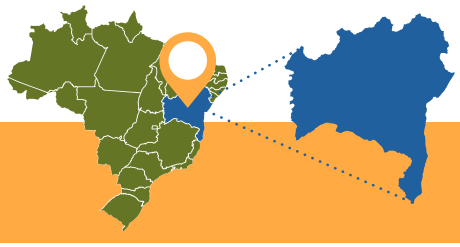
Figure 4

Average in Brazil
0.601

Vitória's rank in Brazil
469th

Vitória's rank in Espírito Santo
14th

Guanambi, Bahia



Human Capital Index: 0.575

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals.

This effort is materialized in the **Human Capital Index (HCI)**, which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child **survival** (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

The municipality of Guanambi shows a strong performance in the Human Capital Index, in comparison to the **state average**. As such, it was chosen to participate in this research.

Guanambi had an HCI of **0.575** in 2019. This means that the future productivity of a child born this year is, on average, **57.5%** of its potential. This value is below the national average of 0.601 *(fig. 2)* and is largely explained by health performance.

Compared to the other cities in the state, Guanambi occupies the **56th** position in Bahia's ranking *(fig. 4)*. Moreover, in recent years the municipality's HCI has significantly increased *(fig. 3)*: from 2007 to 2019, there was an increase of **15.3%** in its HCI. The municipality's per capita income would be **73.8%** higher if human capital were fully promoted.

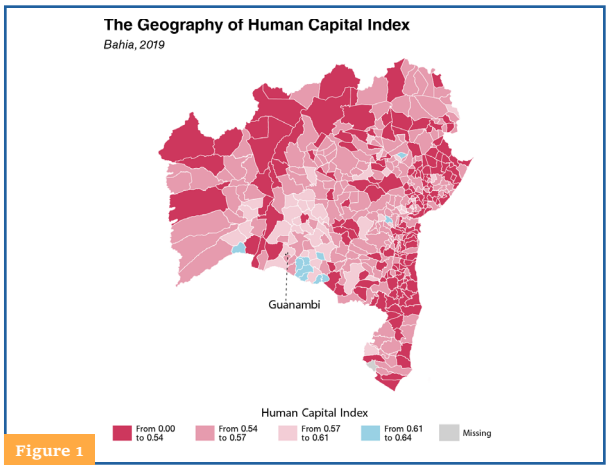
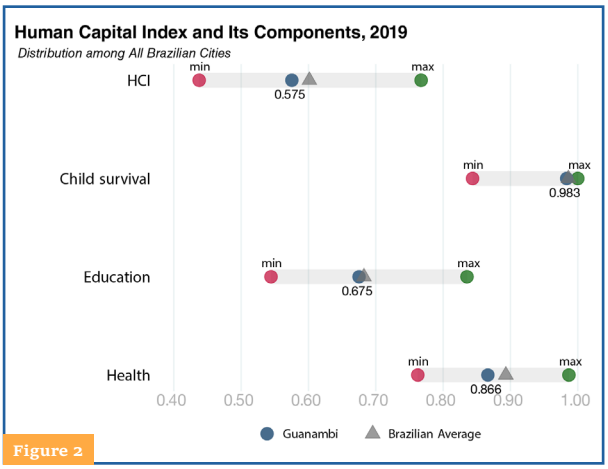


Figure 1



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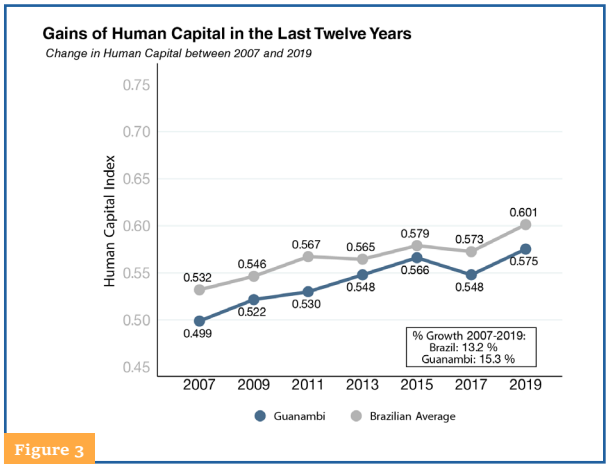

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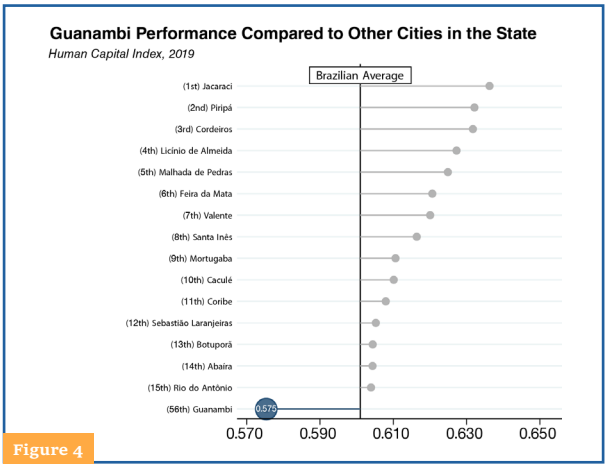


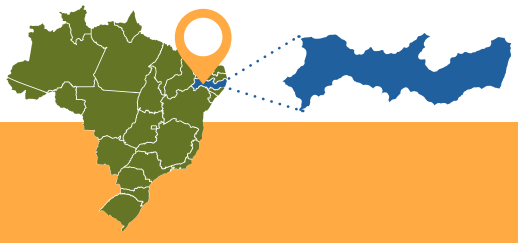
Figure 4

Average in Brazil
0.601

Guanambi's rank in Brazil
3,673rd

Guanambi's rank in Bahia
56th

Ibimirim, Pernambuco



Human Capital Index: 0.661

As part of the institutional agenda, the World Bank launched the Human Capital Project, which emphasizes the importance of investing in the fundamental skills of individuals.

This effort is materialized in the **Human Capital Index (HCI)** which illustrates the productivity of a child born today when entering the job market if current health and education conditions are maintained. It is a prospective indicator based on three components: (i) **health**, measured by the adult survival rate and the child stunting rate; (ii) quantity and quality of **education**; and (iii) the child survival (up to the age of 5). The closer the index is to 1, the better the conditions are for human capital accumulation.

The municipality of Ibimirim shows an accentuated growth in the HCI over the years, and for this reason was chosen to participate in this research.

Ibimirim had an HCI of **0.661** in 2019. This means that the future productivity of a child born this year is, on average, **66.1%** of its potential. This value is above the national average of 0.601 *(fig. 2)* and is largely explained by educational performance.

Compared to the other cities in the state, **Ibimirim** occupies the **4th** position in Pernambuco's ranking *(fig. 4)*. **Ibimirim** stands out for the accentuated growth of its HCI *(fig. 3)*: from 2007 to 2019, there was an increase of 45.0% in the municipality's HCI. The municipality's per capita income would be **51.3%** higher if human capital were fully promoted.

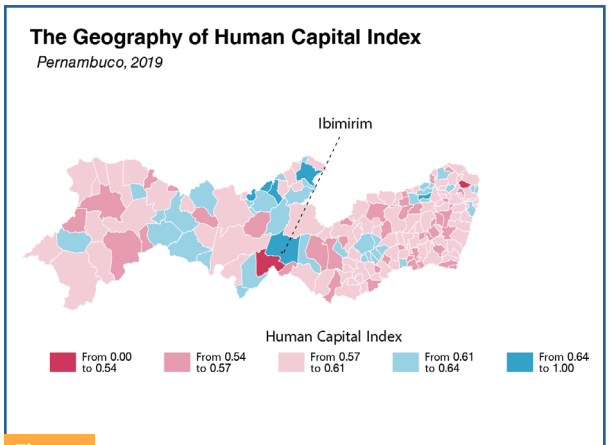
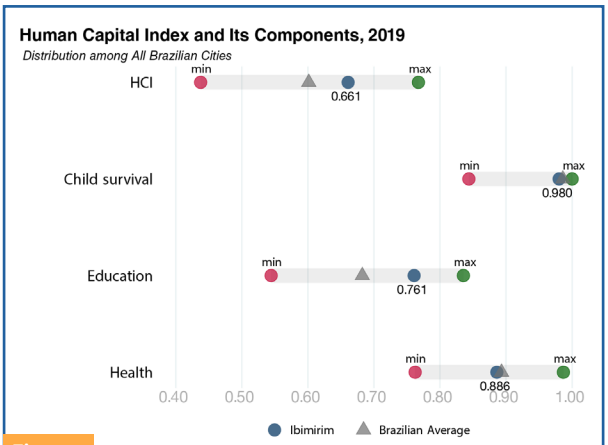


Figure 1



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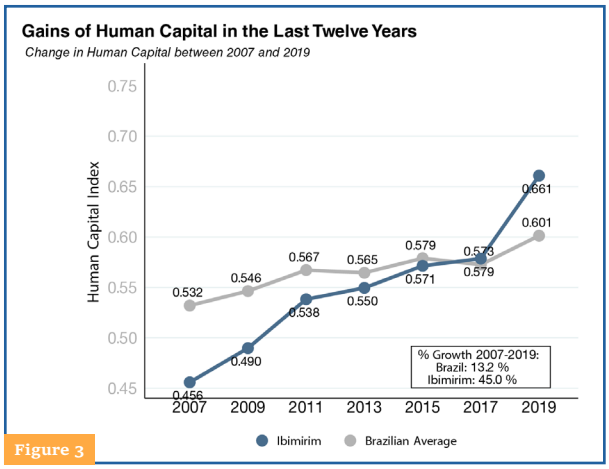

Figure 3

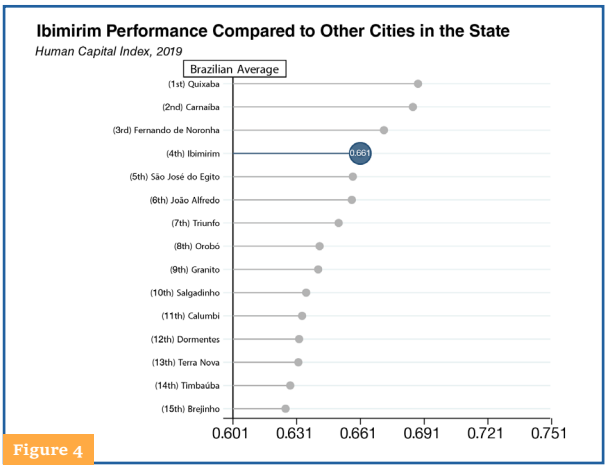

Figure 4

Average in Brazil	Ibimirim's rank in Brazil	Ibimirim's rank in Pernambuco
0.601	292nd	4th

Appendix II

Are SAEB and PISA comparable?

The *Sistema Nacional de Avaliação da Educação Básica (SAEB)* is a national learning assessment in Brazil. SAEB is applied every two years and administered to students at the end of each education cycle: grade five (end of primary school), grade nine (end of lower secondary school), and grade 12 (end of upper secondary school) for private and public schools. From 2015 onwards, SAEB has been applied in every public school with at least 20 students, for a sample size of four million students in 2015.

To gain geographic granularity and the possibility of disaggregating HCI data, SAEB is a better option than the *Programme for International Student Assessment* (PISA). PISA is a similarly large-scale education assessment that compares students' knowledge and ability across countries. However, different from SAEB, PISA is applied every three years worldwide and evaluates science in addition to languages and mathematics. The sample is composed of 15-year-old students in 7th grade. In the 2015 Brazilian edition, the sample covers 841 schools and 23,141 students (OECD, 2016).

There are some critical differences between PISA and SAEB. First, the targeted population differs greatly. The typical profile of PISA participants is a high school student in a state-administered school, typically located in an urban area (OECD, 2016). For this reason, PISA fails to be a representative for northern regions in Brazil, which are characteristically more rural. SAEB successfully represents these regions.

Despite the challenge of comparing these assessments, SAEB and PISA have some points in common. Comparing the pedagogical matrix from SAEB (2015) in 9th grade and PISA (2015), both assessments evaluate students' capacity to understand a text beyond decoding. PISA goes further by considering the capacity of students to reflect and analyze a situation critically. In mathematics, SAEB and PISA assess a student's ability to employ mathematical reasoning and create mathematical situations. For these reasons, when analyzing the results at the state-level in 2015, PISA correlates strongly with SAEB, both in mathematics and in reading (correlation of 0.83) (OECD, 2016).

Appendix III

How is the HCI-SES calculated?

The proxy for socioeconomic status is tertiary education completion. Maternal educational level is used for the HCI components referring to childhood education and child survival. For the adult survival rate, an individual's educational attainment is used. Each component is calculated at the state level. Different strategies are used to construct the different parts of the index, as explained below:

Child Survival: The primary data source for this component is the SINASC/Datasus database. The database includes maternal educational level for deaths between 0-1 years old. The share of deaths according to the SES is applied to all deaths between 0-4 years old. For the population data, the percentage of individuals older or equal to 25 years old who completed higher education (from PNAD 2019) is divided by the population according to this share. Child survival is calculated child using the same HCI methodology for each state and each socioeconomic group.

Adult survival rate: The primary data source for adult survival rate is the SIM/Datasus database, which has individual information on educational attainment. To calculate this component, the deaths that occurred in each five-year age group (15-19 years old, 20-24 years old, 25-29 years old, and so on) are used. Because individuals younger than 25 years old may still be studying and there might not be information on maternal educational level, the share of individuals in the 25- to 29-year-old group who have completed higher education is added to these two age groups. For the population, the same strategy as the Child Survival component is used. Adult mortality is calculated using the same HCI methodology for each state and socioeconomic group.

Quality of education: The primary data source for HLO is SAEB, a national assessment system that has information on maternal educational level. When an individual's mother has completed tertiary school, they are considered high-SES; when an individual's mother has not completed tertiary school, they are considered low-SES. The same HCI methodology for each state and socioeconomic group is used to calculate HLO.

Quantity of education: The primary data source for EYS is the School Census. However, that database does not include the mother's education. Therefore, EYS is estimated based on the SES-HLO. Since HLO is directly correlated with EYS, the correlation from 2007 to 2019 is estimated at the state level, after which the SES-EYS is predicted based on the SES-HLO.

Appendix IV

Human Capital Accumulation Amidst the COVID-19 Pandemic

In this Appendix, we describe in detail how we estimate the impact of COVID-19 on the components of HCI. We present the adult survival rate and child survival together, because we rely on the same methodology; we have estimated the number of deaths per age group. Next, we show the methods for calculating the impact on Not Stunting. Lastly, we explain how we calculate the effects on the Education component: Harmonized Learning Outcomes and Expected Years of School.

Adult Survival Rate and Child Survival

To estimate the impact of COVID-19 on Adult Survival Rate and Child Survival, we estimate the number of deaths per **age group** for 2021. The estimated number of deaths for **each age group** is given by three components: i) projected deaths; ii) COVID-19 excess deaths; iii) normal non-COVID-19 deaths (deaths that would have occurred anyway, without COVID-19). We represent this estimation using the following equation:

$$\widehat{Deaths}_{2021} = Projected\ deaths_{2021} + Covid\ Excess\ Deaths_{2021} - Normal\ NonCovid\ Deaths_{2021}$$
$$(main\ equation)$$

Below we describe each component.

Projected deaths

The projected deaths are the expected number of deaths in a scenario without COVID-19, calculated using age-specific mortality projections.

$$Projected\ Deaths_{2021} = [Estimated\ mortality\ rate_{2021}] * Midyear\ Population\ in\ the\ age\ group_{2021}$$

where the estimated mortality rate is given by:

$$Estimated\ mortality\ rate_{2021} = mortality\ rate_{2019} * (1 + rate\ of\ change\ in\ mortality\ rate_{2017,2019})$$

where mortality rate is defined as:

$$Mortality\ rate = \frac{Number\ of\ deaths\ in\ the\ age\ group}{Midyear\ Population\ in\ the\ age\ group}$$

COVID-19 excess deaths

COVID-19 excess deaths are the number of direct and indirect deaths due to COVID-19, given by:

$$Covid\ Excess\ Deaths_{2021} = Direct\ Covid\ Deaths_{2021} * (1 + non\ direct\ deaths\ rate_{2021})$$

Direct COVID-19 deaths

Direct COVID-19 deaths are those from 1 January 2021 to 31 December 2021 recorded in the Severe Acute Respiratory Syndrome (SRAG) database[1] provided by the Health Ministry. This data includes all hospitalizations due to respiratory diseases, including COVID-19. As such, if a death by COVID-19 occurred

[1] Available here: https://opendatasus.saude.gov.br/dataset/bd-srag-2021

without hospitalization, it does not appear in the database, leading to a sub-estimation.[2] For example, using this source, the total COVID-19 deaths in 2021 is 358,100, and if we use the data from the COVID-19, which come from state Health Secretaries,[3] the number of COVID-19 deaths in 2021 is 413,400, 15 percent higher (reference date 7 November 2021). However, in this last source, we cannot access deaths by age group, which is essential to calculating the adult survival rate and the child survival rate. Below, we describe two other possible sources of information about COVID-19 direct deaths, and we explain why they are not well-suited for our analysis.

An alternative data source for COVID-19 direct deaths is preliminary results in the Mortality System Information,[4] which we use to calculate mortality for other years. This database registers all deaths, both in and out of hospitals. Also, this database includes better information about race, schooling, and occupation than the SRAG database. However, this data is only available until May 2021, thus, we did not use this data for the HCI simulations.[5]

We could have also used the Civil Registry database,[6] which records all registered deaths independent of hospitalization. However, data is unavailable for the five years intervals, which we need to calculate this disaggregation to determine the adult survival and child survival rates.

Non-direct deaths rate

Some deaths are indirectly related to COVID-19. For example, deaths caused by the overloading of the healthcare system or the postponing of health treatments. Also, there are sub-notifications of COVID-19 deaths, which is not exactly indirect deaths, but deaths that are not counted in the direct deaths described in the last subsection. These non-direct deaths are not observable. As such, we need to estimate the number of non-direct deaths.

For that, we use the *excess deaths* estimates of a different source. Put simply, the idea of excess deaths is to project the deaths in 2020 and 2021 through a time series where there was no special event. This is called the *expected deaths*. The excess deaths are the observed deaths during the pandemic (observable) less than the expected deaths. This remainder are the deaths directly and indirectly attributable to COVID-19. The better the model for predicting expected deaths, the better the approximation of excess deaths from the non-observed reality.

We have three different sources for COVID-19 excess deaths for Brazil: the National Council of Health Secretaries (CONASS),[7] the Institute for Health Metrics and Evaluation (IHME),[8] and The Economist.[9] The first two have excess deaths calculated by state, and the latter only at the national level. These data sources use different expected deaths models.[10] For our estimations, we used IHME excess deaths, since it it is available by state and has lower bound, point, and upper bound estimates, producing three different scenarios (which we call optimistic, realistic, and pessimistic). CONASS has only the point estimate.

Why did we choose not to use only excess mortality? We needed the deaths per age group, and excess

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[2] To extract only the deaths of the database, we filtered: i) case evolution *(evolução caso),* classified as deaths or deaths by other factors; and ii) final classification *(classificação final do caso)* as Severe Acute Respiratory Syndrome by COVID-19.

[3] Available here: https://covid.saude.gov.br/

[4] Available here: https://opendatasus.saude.gov.br/dataset/sistema-de-informacao-sobre-mortalidade/resource/da17c5f6-aa89-4e7d-b7e2-ec4b77a5dc31

[5] We used Mortality System Information data for other purposes, e.g., when we count deaths by race and schooling level.

[6] Available here: https://transparencia.registrocivil.org.br/especial-covid

[7] Available here: https://www.conass.org.br/indicadores-de-obitos-por-causas-naturais/

[8] Available here: http://www.healthdata.org/covid/data-downloads

[9] Available here: https://www.economist.com/graphic-detail/coronavirus-excess-deaths-tracker

[10] CONASS uses exponential regression; IHME uses spline regression; and The Economist uses an algorithm to train an ordinary least squares model.

mortality estimates are unavailable by age group, so we could not use it directly in our estimations. Since we have the projected deaths and the direct deaths per age group, we created a proxy[11] for non-direct deaths rate using the excess deaths estimations, given by:

$$\text{non} - direct\ deaths\ rate_{2021} = 1 - \frac{Direct\ Covid\ Deaths_{2021}}{Excess\ Deaths_{2021}}$$

We used this proxy for all age groups. The basic assumption is the rate of indirect deaths is the same across age groups.

Normal Non-COVID-19 deaths

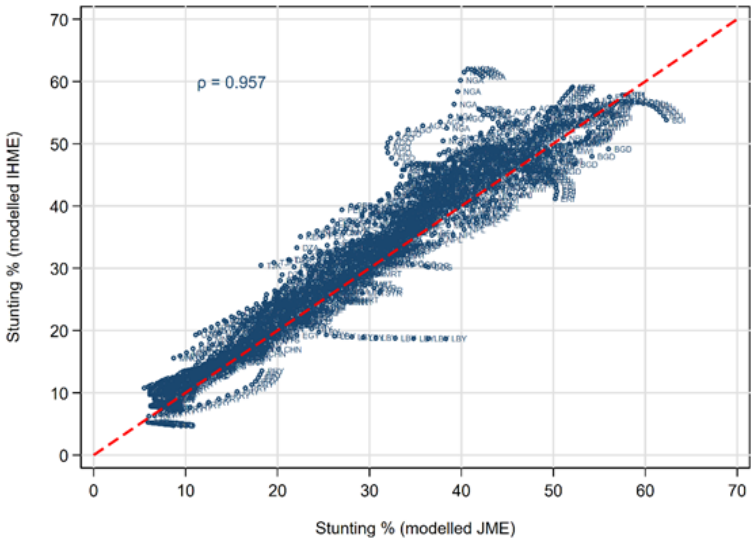
This component accounts for the deaths that would have occurred anyway, without COVID-19, among those who died from COVID-19. We estimate:

$$Normal\ NonCovid\ Deaths_{2021} = (Covid\ Excess\ Deaths_{2021}) * Estimated\ mortality\ rate_{2021}$$

Note that all the components are calculated separately for each age group (except the percentage of indirect deaths).

Stunting

The subnational level estimates are obtained from the Institute of Health Metrics and Evaluation (IHME on an annual basis between 2007 and 2017. National country-level estimates are available from the UNICEF/WHO/World Bank Group joint child malnutrition estimates (JME) on an annual basis between 2007 and 2020. For Brazil, the latest available survey datapoint for malnutrition is dated from 2006.[12] National level estimates are produced by JME, and according to these national estimates, stunting is estimated to remain constant, at around 6.1 percent between 2014 and 2020.[13] Because of that, and since the JME and IHME stunting estimates are very much correlated across countries, we have used the estimates from 2017 for 2019. The figure below shows the correlation between JME and IHME estimations, resulting in a correlation of 0.957.



We used the national estimates from the Goalkeepers Report (Bill & Melinda Gates Foundation) to estimate the impact on stunting among children under age five in Brazil. According to their estimates, we have the following:

[1] Since this rate is non-observable, we call it a proxy.

[2] From Pesquisa nacional de demografia e saúde da criança e da mulher - PNDS 2006. Relatório da pesquisa. Sao Paulo: CEBRAP, 2008

[3] United Nations Children's Fund (UNICEF), World Health Organization, International Bank for Reconstruction and Development/The World Bank. Levels and trends in child malnutrition: key findings of the 2021 edition of the joint child malnutrition estimates. New York: United Nations Children's Fund; 2021. Licence: CC BY-NC-SA 3.0 IGO.

(a) Worst scenario: stunting would increase by 2.44 percent in comparison to the scenario without COVID-19.
(b) Reference scenario: stunting would increase by 0.59 percent in comparison to the scenario without COVID-19.
(c) Best scenario: stunting would decrease by 1.20 percent in comparison to the scenario without COVID-19.
To simulate the Not Stunting component of HCI, we considered 2017 rates for the scenario without COVID-19. This is because national estimates indicate no variation in stunting in Brazil from 2014 to 2020 in a scenario withoutCOVID-19.[14]

Harmonized Learning Outcomes

To calculate harmonized learning outcomes, we need SAEB scores for Mathematics and Portuguese. Since we do not have that information for 2021, we assume that the scores would be the same as 2019, but discounted for the as learning loss (ll) rate. In that sense, the Mathematics and Portuguese score for ninth grade in 2021 is estimated as:

$$\text{Simulated math score}_{2021,s} = \text{SAEB math}_{2019,s} * \left(1 + ll\ rate_{s,math}\right)$$

$$\text{Simulated port score}_{2021,s} = \text{SAEB port}_{2019,s} * \left(1 + ll\ rate_{s,Portgueuse}\right)$$

Where s stands for state and the SAEB score refers to the average of the ninth grade. The learning loss rate is estimated in three ways, giving us three scenarios. All three depend on another variable: the number of days of school closure.

Number of days closed

The number of days closed is retrieved from the INEP questionnaire about school responses during COVID-19.[15] INEP has assessed how many days face-to-face activities in each school were suspended during the pandemic. The questionnaire was administered between February and May 2021. Since most states opened schools either at the end of the first semester or at the beginning of the second semester of 2021, the average number collected by INEP is likely a good measure of the length of school closure in each state. Because we are interested in ninth grade scores, we use the average days in primary and lower secondary schools. Since INEP collected the data at school level, they published the statistics of the distribution of school closure length in each state. For the optimistic scenario, we use the number of days corresponding to the first quartile of the distribution. For the realistic and pessimistic scenarios, we use the average number of days. The number of days closed functions as a weight to measure the learning loss rate.

Learning loss rate

The learning loss rate is calculated in the following three scenarios. The learning loss rate in SP is described in Figure 6.4.c and Figure 6.4.d: -5.34 percent in Mathematics and -4.58 percent in Portuguese.

- **Optimistic:**
  Learning loss rate in state s and subject *p* (Mathematics or Portuguese):

$$ll\ rate_{s,p} = \frac{1st\ quartile\ days\ closed_s}{1st\ quartile\ days\ closed\ SP} * \ ll\ rate\ SP_p$$

- **Realistic:**
  Learning loss rate in state s and subject *p* (Mathematics or Portuguese):

$$ll\ rate_{s,p} = \frac{Avg\ \ days\ closed_s}{Avg\ days\ closed\ SP} * \ ll\ rate\ SP_p$$

[14] According to estimates from joint child malnutrition (JME) - UNICEF/WHO/World Bank

[15] https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/pesquisas-suplementares/pesquisa-covid-19

• **Pessimistic**
Learning loss rate in state s and subject *p* (Mathematics or Portuguese):

$$ll\ rate_{s,p} = ll\ rate\ SP * (1\ +\ 0.004)^{(Avg\ days\ closed_s - Avg\ days\ closed\ SP)}$$

The parameter 0.004 represents that for each day more (less) that the schools of state s were closed compared to those of the state of São Paulo, the learning loss rate increases (decreases) by 0.4 percent. The parameter was chosen by: i) calculating the learning loss rate in the optimistic and realistic scenarios; ii) choosing the minimum parameter that generates a learning loss rate more than or equal to the realistic scenario in all states.

Alternative learning loss rate

At the beginning of March 2020, the São Paulo education secretary released the results of SARESP, the state standard assessment. This assessment reached 83.1 percent of ninth graders in the state schools of São Paulo. The loss rate was lower than the sample study used in the previous estimation. For ninth grade, the loss was -5.05 percent in Mathematics and -3.33 percent in Portuguese. Because of that difference, and since this rate is an important parameter for the simulations, we have estimated the scenarios for the harmonized learning outcomes using this lower rate.

HARMONIZED LEARNING OUTCOMES- RESULTS FOR BRAZIL		
	Main estimation	Alternative estimation
Optimistic	0.630	0.633
Realistic	0.628	0.632
Pessimistic	0.628	0.631

Expected Years of School

The expected years of school was estimated through a panel regression. It was estimated using a state and year fixed effects regression, as follows:

$$\text{EYS} = \alpha_s + \beta_{s,t} HLO + t + \varepsilon_{s,t}$$

Where s is the state and t is the dummy for time (2007-2019). The parameters in the regression were used to predict the expected years of school for 2021, given by: $\widehat{EYS}_{s,2021}$ The regression results are presented in the following table:

RESULTS: FIXED EFFECTS REGRESSION - EXPECTED YEARS OF SCHOOL	
	EYS
HLO	7.1285**
	(3.0235)
year=2009	0.1296**
	(0.0523)

RESULTS: FIXED EFFECTS REGRESSION - EXPECTED YEARS OF SCHOOL (CONTINUED)	
year=2011	0.2479**
	(0.1000)
year=2013	0.5396***
	(0.0685)
year=2015	0.4779***
	(0.1095)
year=2017	0.6328***
	(0.1234)
year=2019	0.7763***
	(0.1512)
Constant	5.4116***
	(1.8233)
R-Squared	0.816
Observations	189
F-statistic	36.26

Robust Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Appendix V

Drivers of Human Capital Formation

Variable Definitions

Fiscal variables

For all expense variables, data from FINBRA *(Finanças Municipais)*[16] on expenses by function is used. For 2013 and onwards, "paid expenses" are used, which are the expenses that the municipality definitely paid. Before 2013, there were no differences in expense type, so what accounts for "expenses" is used.

Basic health spending per capita

The variable *Despesa Atenção Básica* is used and divided it by the projected population.

- Health spending per capita

The variable *Despesa Saúde* is used, which corresponds to total health expenses, and divided it by the projected population.

- Sanitation spending per capita

The variable *Despesa Saneamento* is used, which corresponds to total sanitation expenses, and divided it by the projected population.

- Education spending per student

The variable Despesa Ensino Fundamental is used, which corresponds to expenses for grades one to nine, and divided it by the number of enrollments in first to ninth grade (from the School Census).

Bolsa Família

- Number of families receiving Bolsa Família

This variable is constructed using Ministerio do Desenvolvimento Social database. It refers to the average number of families receiving PBF in a given municipality and in each year. The raw database was available for each month and each municipality, and calculated the average for each year and each municipality.

Education-specific variables

- School Infrastructure Index

The following variables are used from School Census [17]: sports court, library, computer lab, science lab, existing plumbing, existing energy, existing water. Only the standard basic schools (Ensino Regular Fundamental e Médio) are selected from first to twelfth grade. The following variables are changed: a) sports court (for 2011 and 2013, the variable was split in two: sports court covered and sports court uncovered, so the variable 'sports court' is constructed from these two); b) existing plumbing, existing energy, existing water: the original variables were in the negative form (non-existence plumbing, water, and energy), so they are recoded to the positive form.

The index using Multiple Component Analysis is generated. The predicted score was standardized to vary from 0 to 1.

[16] Data available at: https://siconfi.tesouro.gov.br/

[17] Data available at: https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/microdados/censo-escolar

• Number of municipal schools

This variable is constructed using the School Census. It is the sum of the number of municipal schools in each municipality each year. Only the standard basic schools (Ensino Regular Fundamental e Médio) were selected (from first to twelfth grade).

• Dummy has private school

This variable is constructed using the School Census. It is a dummy variable that assumes a value of 1 if there is any private school in the municipality in each year, and 0 otherwise. Only the standard primary schools *(Ensino Regular Fundamental e Médio)* were selected (from first to twelfth grade).

• % of white students

This variable is constructed using SAEB/Prova Brasil data. Only ninth grade students are considered. The sum of ninth grade students who self declared that they are white are calculated, divided by the number of students who answered the question about race, and then multiplied by 100.

• % sudents living with mother & father

This variable is constructed using SAEB/Prova Brasil data.[18] Only ninth grade students are considered. The sum of ninth grade students who declared that they live with their mother and the sum who declared that they live with father are calculated, divided by the number of students who answered both questions, and then multiplied by 100.

• % parents with tertiary education

This variable is constructed using SAEB/Prova Brasil data. We considered only ninth grade students. The sum of ninth grade students who declared their mother or father completed tertiary school is calculated, divided by the number of students who answered either of the questions about the parents' level of education, and then multiplied by 100.

• % HS full-time school

This variable is constructed using the School Census - Classes database. Only high school classes (variable *TP ETAPA ENSINO* from 25 to 38) and only classes from municipal and state schools are selected. Full-time classes are defined are those with more or equal to 420 minutes of duration during a school-day.[19]

• Number of teenage pregnancies

We constructed this variable using SINASC-Datasus.[20] We counted the number of births that the mother had when they were less than or equal to 17 years old. We multiplied this number by 100,000 and divided it by the projected population for each municipality.

Hospitalization variables

For all variables from hospitalizations, microdata from SIH-Datasus is used.[21] The municipality of residence, the date of birth, the date of hospitalization, and the ICD code[22] of the primary diagnostic is used.

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[18] Data available at: https://siconfi.tesouro.gov.br/.

[19] The standard school in Brazil is part-time, where the length of a school-day ranging from 4 to 5 hours. Full-time school is usually defined as equal to or more than 7 hours per day (https://inepdata.inep.gov.br/analyticsRes/res/pne/ficha_tecnica/FICHAS%20 TECNICAS_06.pdf).

[20] Data available at: https://datasus.saude.gov.br/

[21] Data available at: https://datasus.saude.gov.br/.

[22] International Classification of Diseases

• Malnutrition

The number of hospitalizations due to malnutrition (ICD codes: from E40 to E46) is used, [23]divided by the projected population from 0 to 4 years old, multiplied by 100,000.

• Sanitation-related

The number of hospitalizations due to lack of sanitation divided by the projected population from 0 to 4 years old, multiplied by 100,000. These hospitalizations include fecal-oral transmissions diseases, vector-borne and water-borne diseases, diseases associated with hygiene, and geohelminths and taeniasi. ICH codes: diarrhoeas (A09), typhoid fever (A25), hepatitis A (B15), dengue (A90), yellow fever (A95), leishmaniasis (B55), cutaneous leishmaniasis (B55.9), visceral leishmaniasis (B55.0), lymphatic filariasis (B74), malaria (B50), Chagas' disease (B57), leptospirosis (A27), schistosomiasis (B65), leptospirosis (A27) schistosomiasis (B65), eye disorders (Z13.5), trachoma (H54.3), conjunctivitis (H10), skin diseases (B08) and superficial mycosis (B36), helminthiasis (B82.0), and taeniasis (B83.9).[24]

• Asthma

The number of hospitalizations due to asthma (ICD codes: J45 and J46) is used[25] divided by the projected population from 0 to 4 years old, multiplied by 100,000.

• Hypertension

The number of hospitalizations for which the direct cause was hypertension (ICD code: I10) is used[26] divided by the projected population from 15 to 59 years old, multiplied by 100,000.

• Obesity

The number of hospitalizations for which the direct cause was obesity (ICD code: E66) is used[27] divided by the projected population from 15 to 59 years old, multiplied by 100,000.

• Diabetes

The number of hospitalizations for which the direct cause was Diabetes mellitus (ICD codes: E10-E14) are used[28] divided by the projected population from 15 to 59 years old, and multiplied by 100,000.

• Alcohol Hospitalizations

The number of hospitalizations related to the alcohol consumption (ICD codes: K700, K704, K709, F100, F101, F102, F103, F104, F105, F106, F107, F108, F109, G312,G621, X450-X459, X650-X659, Y150-Y159, Y900-Y909,Y910-Y919, E244, G721, I426, K292, K852, K860, O354, P043, Q860, R780) is used[29] divided by the projected population from 15 to 59 years old, multiplied by 100,000.

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[23] Definition used in (Otero et al., 2002).

[24] Definition used in . (Siqueira, et al., 2017).

[25] Definition used in (Comaru et al 2016).

[26] Definition used in (Siqueira, et al., 2017).

[27] Definition used in (Siqueira, et al., 2017).

[28] Definition used in (Quarti Machado Rosa et al., 2018)

[29] Definition used in (Garcia et al., 2015).

Hospital Structure

These variables are constructed using CNES-Datasus.[30] Since the database is available for each month-year, the average of the year is calculated.

- X-ray

The average number of x-rays in a given year and municipality is used, divided by the projected population, multiplied by 100,000.

- Hospital Beds

The average number of hospital beds for hospitalization in a given year and municipality is used, divided by the projected population, multiplied by 100,000.

- Family Health Strategy physicians

The average number of physicians *Médicos de estratégia Saúde da Família (Family Health Strategy)* in a given year and municipality are used, divided by the projected population, multiplied by 100,000. In 2007, only information for August to December is available, so the average for that year is used.

- Urgency stations

The average number of SUS establishments that serve on an urgency basis are used[31] in a given year and municipality, divided by the projected population, multiplied by 100,000.

Birth related variables

For all variables, SINASC-Datasus is used. [32]

- % of mother with no school

All births in a given year and municipality where the mother has less than or equal to three years of schooling are counted. This number is divided by the total number of births and multiplied by 100.

- % of poor birth outcomes

All births in a given year and municipality in which the APGAR score in 5 minutes is lower than 7 are counted (Thorngren-Jerneck, Herbst, 2001). This number is divided by the total number of births and multiplied by 100.

- % of cesarean births

All births in a given year and a municipality delivered by cesarean are counted. This number is divided by the total number of births and multiplied by 100.

- % insufficient prenatal care

All births in a given year and municipality in which the mother had fewer than four prenatal appointments are counted. This number is divided by the total number of births and multiplied by 100.

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[30] We extracted the data directly from Tabnet (http://tabnet.datasus.gov.br).

[31] Available here http://tabnet.datasus.gov.br/cgi/deftohtm.exe?cnes/cnv/aturgbr.def.

[32] Data available at: https://datasus.saude.gov.br/.

Other variables

- Adult Sex Ratio

The sex ratio using population estimates is constructed.[33] Only the population from 15 to 59 years old is taken. The men's population is divided by the women's population and multiplied the result by 100.

- Homicides

These variables are constructed using SIM-Datasus.[34] It corresponds to the deaths from aggression (ICD code: X85 to Y09).[35] Only the homicides that occurred when the victim was between the ages of 15 and 59 are considered. That number is divided by the projected population and multiplied it by 100,000.

- % schools with plumbing

Data from the School Census is used.[36] All schools in a given year are counted and municipality that have a public sewage system. The total number of schools is divided and multiplied by 100,000.

Descriptive statistics

TABLE V.1 Descriptive statistics: Dependent variables

	2007		*2019*	
Variables	*Mean*	*CV*	*Mean*	*CV*
Expected Years of School	9.83	0.63	11.01	0.27
Harmonized Learning Outcomes	0.60	0.20	0.65	0.20
HCI - Education Component	0.62	0.32	0.68	0.20
Adult Survival Rate	0.85	0.15	0.87	0.16
Not Stunting	0.89	0.35	0.91	0.25
HCI - Health component	0.88	0.13	0.89	0.15
HCI - Child Survival component	0.98	0.03	0.99	0.02
HCI	0.53	0.45	0.60	0.34

Mean and coefficient of variation (CV) are weighted using population estimates as weight.

[33] Available here http://tabnet.datasus.gov.br/cgi/deftohtm.exe?popsvs/cnv/popbr.def.

[34] We extracted the data directly from Tabnet (http://tabnet.datasus.gov.br).

[35] Definition used in https://www.conass.org.br/guiainformacao/notas_tecnicas/NT6-MORTALIDADE-HOMICIDIOS.pdf.

[36] Data available at: https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/microdados/censo-escolar

TABLE V.2 Descriptive statistics: Child Survival

	2007		2019	
Variables	*Mean*	*CV*	*Mean*	*CV*
Socioeconomic				
% of mothers with no school	9.88	4.72	1.95	5.52
Proxy poverty (Families in PBF)	5,810.51	5.04	6,558.79	3.68
Public Expenditure				
Basic health spending per cap.[2]	200.24	5.25	270.72	3.16
Sanitation spending per cap[2]	63.38	11.02	71.20	8.50
Hospital Structure				
No. X-ray[1]	25.85	4.84	40.19	6.22
Physicians ESF[1]	8.70	4.05	12.61	2.65
Hospitalizations				
% schools with plumbing	57.43	5.36	67.06	3.57
Hosp. malnutrition[1]	37.74	6.85	26.82	7.35
Hosp. sanitation-related[1]	587.67	6.12	339.40	6.49
Hosp. asthma[1]	729.35	4.70	221.87	6.57
Birth & Pre-birth conditions				
% births poor health	1.42	2.06	1.03	1.24
% insufficient prenatal	9.23	3.33	6.50	3.60

Mean and coefficient of variation (CV) are weighted using population estimates as weight.
[1]Variables per 100,000 inhabitants
[2]Deflated using IPCA (date of reference: December 2019)

TABLE V.3 Descriptive statistics: Not Stunting

	2007		2019	
Variables	*Mean*	*CV*	*Mean*	*CV*
Socioeconomic				
% of mothers with no school	9.88	4.72	1.95	5.52
Proxy poverty (Families in PBF)	5,810.51	5.04	6,558.79	3.68
Public Expenditure				
Basic health spending per cap.[2]	200.24	5.25	270.72	3.16

TABLE V.3 Descriptive statistics: Not Stunting (continued)

Hospital Structure				
Physicians ESF[1]	8.70	4.05	12.61	2.65
Hospitalizations				
Hosp. malnutrition[1]	37.74	6.85	26.82	7.35
Birth & Pre-birth conditions				
% births poor health	1.42	2.06	1.03	1.24
% insufficient prenatal	9.23	3.33	6.50	3.60

Mean and coefficient of variation (CV) are weighted using population estimates as weight.
[1] Variables per 100,000 inhabitants.
[2] Deflated using IPCA (date of reference: December 2019)

TABLE V.4 Descriptive statistics: Education

	2007		*2019*	
Variables	*Mean*	*CV*	*Mean*	*CV*
Socioeconomic				
% white students	34.74	2.10	30.13	2.18
% students living with mother & father	61.73	0.67	68.64	0.35
% parents with tertiary education	10.38	1.60	17.02	1.82
Proxy poverty (Families in PBF)	5,810.51	5.04	6,558.79	3.68
Expenses				
Education spending per student[1]	2,416.84	2.60	4,015.63	2.56
School Structure				
School infrastructure index	0.33	2.37	0.30	1.63
No. municipal schools	116.10	32.19	115.95	33.11
Dummy has private school = 1	0.88	1.15	0.90	0.96
% full-time HS classes[2]	0.35	15.41	10.15	5.63
Others				
No. teenage pregnancy[3]	154.75	2.95	92.69	3.43

Mean and coefficient of variation (CV) are weighted using population estimates as weight.
[1] Deflated using IPCA (date of reference: December 2019)
[2] HS: high school
[3] Variables per 100,000 inhabitants

Variables	2007 Mean	2007 CV	2019 Mean	2019 CV
Socioeconomic				
Proxy poverty (Families in PBF)	5,810.51	5.04	6,558.79	3.68
% parents with tertiary education	10.38	1.60	17.02	1.82
Expenses				
Health spending per cap.	492.23	2.37	737.90	2.21
Hospital Structure				
Hospital beds[1]	245.41	2.75	206.05	2.86
No. urgency stations[1]	3.69	5.72	4.92	4.14
Hospitalizations				
Hosp. diabetes[1]	45.70	3.77	42.61	3.14
Hosp. hypertension[1]	45.68	3.48	16.35	4.62
Hosp. obesity[1]	4.22	7.80	11.49	9.47
Hosp. alcohol[1]	76.98	5.44	34.89	4.71
Others				
Adult sex ratio: 100[1](men/women)	96.58	0.54	97.22	0.43
Homicides[1]	36.00	4.12	29.61	5.90

Mean and coefficient of variation (CV) are weighted using population estimates as weight.
[1] Variables per 100,000 inhabitants
[2] Deflated using IPCA (date of reference: December 2019)

Regression tables

TABLE V.6 Results: Fixed Effects Regression - Harmonized Learning Outcomes & Expected Years of School

	(1) Log(HLO)	(2) Log(EYS)
log(school infrastructure index)	0.0030	0.0165***
	(0.0129)	(0.0030)
log(no. municipal schools)	-0.0097***	-0.0005
	(0.0032)	(0.0023)
Dummy has private school = 1	0.0026	0.0005
	(0.0017)	(0.0024)
log(education spending per student)	0.0008	0.0009***
	(0.0007)	(0.0002)
log(no. families PBF[1])	-0.0041	0.0028

TABLE V.6 Results: Fixed Effects Regression - Harmonized Learning Outcomes & Expected Years of School (continued)

	(0.0039)	(0.0032)
% white students	0.0004***	-0.0000
	(0.0001)	(0.0001)
% parents with tertiary education	0.0016***	0.0001
	(0.0002)	(0.0001)
% students living w/ parents	0.0001	0.0002**
	(0.0001)	(0.0001)
% of full-time school	0.0002**	0.0002***
	(0.0001)	(0.0000)
log(no. teenage pregnancy[1])	0.0011	-0.0038***
	(0.0008)	(0.0009)
Constant	-0.3611***	2.4295***
	(0.0316)	(0.0240)
R-Squared	0.431	0.694
Observations	37042	37042
F-statistic	373.89	382.14

All regressions are with municipality, year, and state-trend fixed effects
Robust Standard errors in parentheses
[1] Variables per 100,000 inhabitants
* p<0.10, ** p<0.05, *** p<0.01

TABLE V.7 Results: Fixed Effects Regression - Adult Survival Rate

	(1)
	Log(Adult Survival Rate)
log(no. urgency stations[1])	0.0015***
	(0.0006)
log(hosp. beds[1])	0.0003
	(0.0003)
log(hosp. alcohol[1])	-0.0001
	(0.0002)
log(hosp. hypertension[1])	-0.0001
	(0.0002)
log(hosp. diabetes[1])	-0.0009***
	(0.0002)
log(health spending per cap.)	-0.0002

TABLE V.7 Results: Fixed Effects Regression - Adult Survival Rate (continued)

	(0.0006)
log(no. families PBF[1])	-0.0035***
	(0.0011)
% parents with tertiary education	0.0001
	(0.0001)
adult sex ratio: 100*(men/women)	0.0001**
	(0.0000)
log(homicides[1])	-0.0081***
	(0.0003)
Constant	-0.0946***
	(0.0125)
R-Squared	0.249
Observations	37123
F-statistic	125.83

All regressions are with municipality, year, and state-trend fixed effects
Robust Standard errors in parentheses
[1] Variables per 100,000 inhabitants
* p<0.10, ** p<0.05, *** p<0.01

TABLE V.8 Results: Fixed Effects Regression – Not Stunting & Child Survival

	(1) *Log(Not Stunting)*	*(2)* *Log(Child Survival)*
log(Family Health Strategy physicians[1])	0.0004***	-0.0001
	(0.0001)	(0.0001)
log(hosp. malnutrition[1])	-0.0001*	-0.0001***
	(0.0000)	(0.0000)
% poor birth outcomes	0.0000	-0.0008***
	(0.0001)	(0.0002)
% insufficient prenatal	-0.0000	-0.0001***
	(0.0000)	(0.0000)
log(basic health spending per cap.)	-0.0000	-0.0001
	(0.0001)	(0.0000)
% of mothers with no school	-0.0004***	-0.0001***
	(0.0001)	(0.0000)
log(no. families PBF[1])	-0.0008*	-0.0004*
	(0.0004)	(0.0002)

TABLE V.8 Results: Fixed Effects Regression – Not Stunting & Child Survival (continued)

log(no. raiox[1])		0.0002
		(0.0001)
log(hosp. asthma[1])		-0.0000
		(0.0000)
log(hosp. sanitation-related[1])		-0.0000*
		(0.0000)
log(sanitation spending per cap.)		-0.0000
		(0.0000)
% of schools with plumbing		0.0000**
		(0.0000)
Constant	-0.0888***	-0.0120***
	(0.0035)	(0.0019)
R-Squared	0.756	0.080
Observations	37969	37969
F-statistic	431.02	38.47

All regressions are with municipality, year, and state-trend fixed effects
Robust Standard errors in parentheses
[1] Variables per 100,000 inhabitants
* p<0.10, ** p<0.05, *** p<0.01

TABLE V.9 Results: Fixed Effects and IV Regression - Expected Years of School

	FE	*IV*	*First stage*
	Log(EYS)	*Log(EYS)*	*Log(No. families PBF)*
log(no. families PBF[1])	0.0028	0.0313***	
	(0.0032)	(0.0111)	
log(school infrastructure index)	0.0165***	0.0147***	0.0456
	(0.0030)	(0.0035)	(0.0326)
log(no. municipal schools)	-0.0005	0.0004	0.0104
	(0.0023)	(0.0021)	(0.0342)
Dummy has private school = 1	0.0005	-0.0004	0.0243***
	(0.0024)	(0.0021)	(0.0069)
log(education spending per student)	0.0009***	0.0015***	-0.0190**
	(0.0002)	(0.0005)	(0.0094)
% white students	-0.0000	-0.0001	0.0008

TABLE V.9 Results: Fixed Effects and IV Regression - Expected Years of School (continued)

	(0.0001)	(0.0001)	(0.0007)
% parents with tertiary education	0.0001	0.0000	0.0018*
	(0.0001)	(0.0001)	(0.0010)
% students living w/ parents	0.0002**	0.0002**	0.0005
	(0.0001)	(0.0001)	(0.0008)
% of full-time school	0.0002***	0.0002***	-0.0011***
	(0.0000)	(0.0000)	(0.0003)
log(no. teenage pregnancy[1])	-0.0038***	-0.0042***	0.0099*
	(0.0009)	(0.0008)	(0.0056)
log(no. elderly BPC[1])			0.0298***
			(0.0053)
lag: log(no. families PBF[1])			0.1966***
			(0.0248)
Constant	2.4295***		
	(0.0240)		
R-Squared	0.694	0.685	
Observations	37042	37027	37027
F-statistic	382.14	386.05	62.93
Hansen-J (p-value)		0.88	

All regressions are with municipality, year, and state-trend fixed effects
Robust Standard errors in parentheses
[1] Variables per 100,000 inhabitants
* p<0.10, ** p<0.05, *** p<0.01

TABLE V.10 Results: Fixed Effects and IV Regression - Not Stunting

	FE	*IV*	*First stage*
	Log(Not Stunting)	*Log(Not Stunting)*	*Log(No. families PBF)*
log(no. families PBF[1])	-0.0008*	0.0085**	
	(0.0004)	(0.0042)	
log(Family Health Strategy physicians[1])	0.0004***	0.0005***	-0.0111
	(0.0001)	(0.0001)	(0.0073)
log(hosp. malnutrition[1])	-0.0001*	-0.0001*	-0.0004
	(0.0000)	(0.0000)	(0.0013)

TABLE V.10 Results: Fixed Effects and IV Regression - Not Stunting (continued)			
% poor birth outcomes	0.0000	0.0001	-0.0018
	(0.0001)	(0.0000)	(0.0011)
% insufficient prenatal	-0.0000	-0.0000	-0.0031***
	(0.0000)	(0.0000)	(0.0008)
log(basic health spending per cap.)	-0.0000	-0.0001	0.0086**
	(0.0001)	(0.0001)	(0.0035)
% of mothers with no school	-0.0004***	-0.0004***	-0.0025***
	(0.0001)	(0.0000)	(0.0007)
log(no. elderly BPC[1])			0.0382***
			(0.0064)
Constant	-0.0888***		
	(0.0035)		
R-Squared	0.756	0.732	
Observations	37969	37968	37968
F-statistic	431.02	488.59	35.39
Hansen-J (p-value)			

All regressions are with municipality, year, and state-trend fixed effects
Robust Standard errors in parentheses
[1]Variables per 100,000 inhabitants
* p<0.10, ** p<0.05, *** p<0.01

Appendix VI

Subnational Human Development Policies

ANNEX 1: Survey Questions

EDUCATION

NUMBER	PROPOSED QUESTIONS
1	Municipal schools have the autonomy to: [ ] Develop pedagogical curriculum [ ] Develop performance goals [ ] Implement extracurricular actions and thematic projects [ ] Financially manage the school [ ] School maintenance[ ] No, the secretariat centralizes the school administration [ ]] Other____
2	Who prepares the pedagogical project of schools? [ ] The secretariat provides a ready-made model [ ] The schools adapt a model offered by the Secretariat [ ] The schools prepare their own project (with autonomy) [ ] The schools prepare their own project with the support of the Secretariat
3	Does the Department of Education use data from students, teachers, and schools as information for decision making? In what way? [ ] Performance Goals [ ] Resource Allocation [ ] Teacher Performance Assessment [ ] Principal Performance Assessment [ ] Development of specific programs adapted to the school context [ ] Does not use data
4	Does the Department of Education support schools to reduce school dropout? [ ] Yes [ ] No
5	Does the Secretariat identify students who drop out of school? [ ] Yes, through a data system [ ] Yes, the secretariat supports the schools to carry out this monitoring [ ] No, the school does not carry out this monitoring (If so, what was the biggest challenge to identifying student dropouts before the pandemic?)
6	Does the Department of Education provide structured material for elementary school teachers for the initial and final years? [ ] Yes, prepared by the secretariat [ ] Yes, prepared by another authority [ ] No
7	Does the Department of Education have a program that promotes child literacy? (e.g., the federal government's More Literacy Program) [ ] yes [ ] no (If so, what were the challenges in implementing this program before the pandemic?)
8	Are there any municipal programs/actions that personalize/customize teaching to the pedagogical needs of students? [ ] Yes, for all students [ ] Yes, for low-achieving students only [ ] Yes, for Special Education [ ] Yes, for the Indigenous curriculum [ ] No
9	Does the municipality have a program to adapt the school structure for students and teachers with special needs? [ ] Yes [ ] No (If so, what were the challenges in implementing this program before the pandemic?
10	Do schools in the municipality have an internet provision program? (e.g., the Connected Education Program (*Programa Educação Conectada*). [ ] Yes [ ] No (If so, what were the challenges in implementing this program before the pandemic?)
11	Does the Department of Education monitor the quality of school meals?

NUMBER	PROPOSED QUESTIONS
12	Does the Department of Education monitor the performance of students in the municipal network? [ ] Yes [ ] No (If yes, what is the frequency of monitoring? What is monitored?)
13	Does the Department of Education monitor teacher absenteeism? [ ] Yes [ ] No
14	There is a policy of continuing education for professionals able to work in: [ ] early childhood education (nursery and primary schools) [ ] Indigenous education [ ] education for students with special needs [ ] board members [ ] teachers [ ] schools in vulnerable areas [ ] There are no ongoing training activities promoted by the Secretariat
15	How are principals selected for the municipality's schools? 1 - Exclusively by management appointment 2 - Qualified selection process and management appointment 3- Specific public competition for the position of school manager 4 – Electoral process with the participation of the school community 5 - Qualified selection process and election with the participation of the school community 6. Other
16	Do teachers or principals earn salary bonuses if the school they work for performs above the expected/target?
17	What were the three main challenges faced by the department of Education before the pandemic?
18	Regarding the COVID-19 pandemic, when were face-to-face school activities suspended and what was the return date?
19	In which media format did the Secretariat offer distance learning during the pandemic? [ ] TV [ ] Radio [ ] Printed Material [ ] Online Classes [ ] Digital Applications [ ] No Offer [ ] Others
20	How did the Secretariat deal with the lack of connectivity? [ ] provided internet (e.g., prepaid chips) [ ] provided internet and devices (e.g., prepaid chips and tablets/notebooks) [ ] provided devices (tablets/notebooks) [ ] did not provide connection options[ ] other (box to describe other)
21	Did the school provide alternatives to school meals during the pandemic? [ ] Yes [ ] No
22	What were the main challenges for the department during the COVID-19 pandemic?
23	Cite the three main challenges for reopening schools post-pandemic.

HEALTH

NUMBER	PROPOSED QUESTIONS
1	Does the municipality have a program to promote a pharmaceutical assistance network? e.g., Popular Pharmacy Program (*Programa Farmácia Popular*) [ ] Yes [ ] No
2	Does the municipality have an effectively operationalized vitamin A supplementation program? e.g., National Vitamin A Supplementation Program (*Programa Nacional de Suplementação de Vitamina A*). [ ] Yes [ ] No (If so, describe the challenges before the pandemic in implementing this program.)
3	Does the municipality have a human milk bank program? [ ] Yes [ ] No (If so, what were the challenges in maintaining this program before the pandemic?)
4	Does the municipality have a program that provides public space for exercise and leisure activities? e.g., Federal Health Academy Program (*Programa Federal Academia da Saúde*). [ ] Yes [ ] No
5	Does the municipality reach the target for HPV vaccination? (80 percent of the population of girls aged 9 to 14 years, and of the population of boys aged 11 to 14 years). [ ] Yes No [ ]
6	Is there an HPV immunization plan in schools? [ ] Yes [ ] No (If so, what were the challenges to maintaining this program before the pandemic?
7	Does the municipality promote immunization actions that integrate the health, social assistance, and education departments? [ ] Yes [ ] No (If so, what is the name of this action/program?)
8	Does the municipality offer a permanent training program for primary health care professionals to promote the practice of breastfeeding? [ ] Yes [ ] No
9	Is there a municipal breastfeeding campaign? e.g., National Breastfeeding Program of the federal government (*Programa Nacional de Aleitamento Materno*). [ ] Yes [ ] No (If so, what challenges did you face in implementing this program before the pandemic?)
10	Does the municipality have actions/plans to reduce teenage pregnancy? [ ] Yes [ ] No (If so, what actions are taken?)
11	Are there integrated actions between the department of Health and the department of Education regarding family planning policies in schools? [ ]Yes [ ] No (If so, what actions are performed?)
12	Does the municipality have a family planning promotion plan? [ ] Yes [ ] No
13	Are there coordinated actions between the Department of Social Protection and the Department of Health in the execution of family planning actions? [ ] Yes [ ] No (If so, what actions are performed?)
14	Does the municipality promote follow-up actions for chronic diseases? [ ] Yes [ ] No (If so, what actions are performed?)
15	Does the municipality have an agenda for child malnutrition? [ ]Yes [ ] No (If so, what were the challenges faced in dealing with child malnutrition before the pandemic?)

NUMBER	PROPOSED QUESTIONS
16	Does the municipality have a municipal health plan? [ ] Yes [ ] No (If so, how often is the municipal health plan reviewed?)
17	Does the municipality have guidelines and an implementation plan for labor and birth care? (If so, what challenges did you face in implementing these guidelines before the pandemic?)
18	Is there a training plan for primary care workers? [ ] Yes [ ] No (If so, is there a specific space for the training of primary health care employees in the units of the municipality?)
19	Does the municipality have a plan for ongoing training of health professionals? [ ] Yes [ ] No (If so, is the municipality part of a municipal network focused on the continuing education of health professionals?)
20	Does the municipality have an education, training, and improvement plan for professionals from the Municipal Health Network Specialized in STI/AIDS? [ ] Yes [ ] No
21	Does the Health Department have a Control, Assessment, Regulation, and Audit Service plan on the quality and resolution of health actions and services for SUS users? [ ] Yes [ ] No
22	Does the municipality have a mobile pre-and inter-hospital care system? [ ] Yes [ ] No (If so, how many functioning ambulances does the municipality have?)
23	What actions does the municipality take to respond to COVID-19 in terms of planning?
24	What actions does the municipality take to respond to COVID-19 in relation to monitoring practices and actions?
25	What actions does the municipality take to respond to COVID-19 in relation to acquisitions?
26	What actions does the municipality take to respond to COVID-19 in terms of hiring staff?
27	What other actions does the municipality carry out to respond to COVID-19?

SOCIAL PROTECTION

NUMBER	PROPOSED QUESTIONS
1	What challenges does the municipality face in meeting the criteria adopted for the territorial distribution of CRAS and CREAS defined by the Federal Government (pre-COVID-19)?
2	What is the estimated ratio of CRAS population coverage to the vulnerable population of the municipality?
3	Is CRAS running the Comprehensive Family Care Service *(Serviço de Atendimento Integral à Família* - PAIF)? [ ] Yes [ ] No (If so, what is the estimated coverage of monitoring of families in situations of social vulnerability in the municipality?)

NUMBER	PROPOSED QUESTIONS
4	Does the municipality have a permanent training plan for social assistance professionals? [ ] Yes [ ]No
5	Does the municipality have a Social Assistance Surveillance area in place? [ ] Yes [ ] No (If yes, do you carry out a socio-territorial diagnosis? [ ] Yes [ ] No
6	Have the goals of the last municipal social assistance plan been achieved? [ ] 0-25 percent [ ] 26-50 percent [ ] 51-75 percent [ ] 76-100 percent
7	If below 75 percent, list the top 3 challenges to achieving the goals.
8	Does the municipality have its own systems for georeferencing, monitoring, and evaluation of its social assistance policy?
9	Is there a municipal plan to actively seek out specific vulnerable groups? [ ] Yes [ ] No (If so, which groups?)
10	Does the municipality use the information from the Single Registry to formulate public policies on social assistance? [ ] Yes [ ] No
11	Is there a referral and counter-referral protocol between CRAS and CREAS? [ ]Yes [ ] No
12	Is there a protocol for the Integration of SUAS offers? [ ] Yes [ ] No
13	Is there a specific municipal program for entering the job market (check all options): [ ] women [ ] people with disabilities [ ]socio-learning [ ] homeless people [ ] other [ ] There is no action /program for the insertion of the population in the labor market
14	Does the municipality have an early childhood care program? [ ] children's visitation program [ ] coexistence and strengthening of ties (parents) [ ] Workshops with families [ ] community actions [ ] others ____specify [ ] there is no early childhood care program
15	What are the challenges associated with implementing an early childhood care program?
16	Is there a protocol to identify exposure to domestic violence and care for victims? [ ] Yes [ ] No
17	Does CRAS/CREAS have a protocol for identifying and dealing with child labor? [ ] Yes [ ] No
18	Does the municipality have a municipal food and nutrition security policy? [ ] Yes [ ] No
19	Does the municipality have a food and nutrition education program integrated with SUAS? [ ] Yes [ ] No (If so, what program?)
20	Does the municipality promote integrated actions for insertion into the labor market through family farming? [ ] Yes [ ] No

NUMBER	PROPOSED QUESTIONS
21	What was the biggest supply demand of SUAS in the COVID-19 pandemic? **Services:** [ ] Protection and Comprehensive Care for the Family (Proteção e Atenção Integral à Família - PAIF) [ ] Coexistence and Strengthening of bonds [ ] Flying/Sporadic Teams [ ] Basic Social Protection at Home for the Elderly and for People with Disabilities [ ] Protection and Specialized Care for Families and Individuals - PAEFI [ ] Social Approach [ ] Social Protection for Homeless People [ ]Special Social Protection for People with Disabilities, the Elderly and their Families [ ] Institutional Shelter Services [ ]Social Protection for Adolescents in Compliance with the Socio-educational Freedom Measure [ ] Provision of Services to the Community (Prestação de Serviços à Comunidade - PSC) [ ] Social Protection in a Situation of Public Calamity
21	**Programs**: [ ] Long-term Benefit at School (BPC na Escola) [ ] BPC at School [ ] Long-term benefit at work (BPC Trabalho) [ ] Acessuas Trabalho [ ] Strategic Actions of the Child Labor Eradication Program (Programa de Erradicação do Trabalho Infantil) [ ] Criança Feliz [ ] Bolsa Família [ ] Programs (state and municipal) **Benefits**: [ ] Occasional benefit (birth aid; death grant; assistance in situations of temporary vulnerability; assistance in disaster and public calamity situations) [ ] Continued benefit [ ] Income transfer benefits (state and municipal)
22	What were the three main challenges faced by the social protection network to ensuring the management of Bolsa Família *and* Cadastro *Único* during the COVID-19 pandemic?
23	What were the three main challenges associated with the operationalization of the other SUAS actions in 2020, during the COVID-19 pandemic?
24	Does the municipality have a contingency plan for emergencies in Social Assistance? [ ] Yes [ ] No (If so, is the plan integrated with Civil Defense?)
25	Which areas of SUAS do you believe most need reform or reinforcement in your municipality? (e.g., budgets, standards, human resources, management, etc.)

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